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CITY COUNTY STATE

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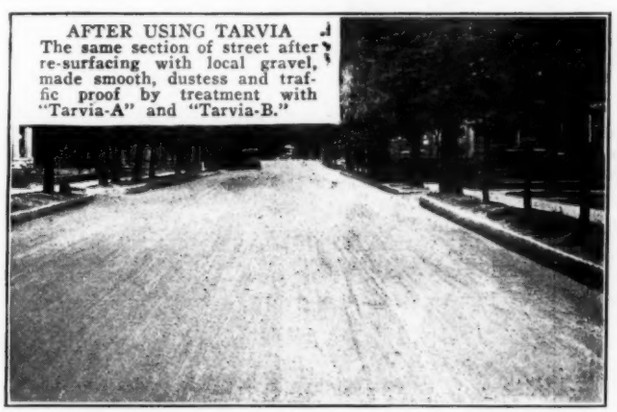
"MUNICIPAL JOURNAL AND PUBLIC WORKS" and "CONTRACTING"

BEFORE USING TARVIA
South Denton Street, Gainesville, Tex., a gravel road before treatment with Tarvia. Note how road has gone to pieces under traffic.



AFTER USING TARVIA
The same section of street after re-surfacing with local gravel, made smooth, dustless and traffic proof by treatment with "Tarvia-A" and "Tarvia-B."

"There are no arguments against saving what you've got"—

THE war taught us many things, not the least of which was thrift—pertinently termed "saving what you've got." Thrift showed us that last year's shoes could be resoled and that the old suit—with a little mending and pressing—had another year's wear in it.

It showed many cities and towns that the policy of "saving what you've got" could be applied to their road problems. They reasoned this way:

"High costs may offer good arguments for delaying new road construction at this time, but *there are no arguments against saving what you've got.* To neglect the roads already built is waste and *waste is a crime.*"

If your macadam roads are good, keep them good; if they're in bad shape, *repair them!*

That may mean Tarvia patching and surface treating; the widening of narrow roads by adding Tarvia macadam shoulders, or it may mean utilizing the old macadam as the foundation for a traffic-proof Tarvia top.

Road improvements like these are not makeshift methods. They are the logical solution of the good roads problem in hundreds of communities today.

Best of all, the cost is low, the maintenance cheap and the satisfaction a blessing to the entire community.

Tarvia roads are mudless, dustless, waterproof and frostproof. The smooth-running durable surface resists the hardest traffic.

Our engineers will gladly consult with you, without obligation, in solving your road problems with Tarvia.

Advice on your own road problem can be had from the nearest Barrett office.

SPECIAL SERVICE DEPARTMENT

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by anyone interested. If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will be given prompt attention. Booklets free.

Tarvia

Preserves Roads—Prevents Dust

The Barrett Company

New York, Cincinnati, Minneapolis, Duluth, Lebanon, Chicago, Pittsburgh, Nashville, Dallas, Youngstown, Philadelphia, Detroit, Salt Lake City, Milwaukee, Toledo, Columbus, Richmond, Latrobe, Bethlehem, Boston, New Orleans, Seattle, Bangor, Elizabeth, St. Louis, Birmingham, Peoria, Washington, Buffalo, Cleveland, Kansas City, Auburn, Johnstown, Baltimore

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Reconstructing East Main Street Bridge, Rochester

Reconstructing wide, short-span city bridge over railroad tracks under difficulties, without interrupting traffic. New trusses temporarily supported by old ones and vice versa. Steel unloaded and erected by stiffleg derricks on abutments

A municipal bridge, built in about 1890 by the Rochester Bridge Company, carried two electric car tracks, two roadways and two sidewalks over four main tracks and two yard tracks of the New York Central Railroad, where they intersect Main street, Rochester, New York.

The superstructure which contained about 380 tons of steel, was 115 feet long and 86 feet wide overall, with a clearance of only 16½ feet above the base of rails in the tracks below.

The bridge was skewed 53 degrees 33 minutes with the railroad tracks and had five double-intersection, riveted latticed girder trusses 20 feet deep carrying a buckle-plate floor.

ROADWAY CARRIED BY NEW TRUSSES. STEEL DERRICK IN POSITION CLEARING TROLLEY TRACKS

After the bridge had been several years in service, the floorbeams were trussed with bent screw-end rods and were enclosed in protecting concrete, which strengthened them so much that they still carried the heavy loads although, when removed in 1915, some of the steel webs were corroded completely through. Above the floor, the trusses were in excellent condition. The masonry abutments and foundations were sound and satisfactory, and were utilized for the new superstructure after cutting them down to an elevation 9 feet below the original bridge seats and re/building the upper parts with concrete suited to the entirely different bridge seats for the new trusses.

The new structure has five lines of latticed girder trusses 115 feet long and 12½ feet deep overall, which support Bethlehem rolled girder beams 24 inches deep and beam stringers. These carry a flat slab, reinforced concrete floor continuous over entire structure which protects all of the steel work from the fumes of locomotives passing below, which had greatly damaged the floor of the original structure. The new steelwork, weighing about 470 tons, was designed by the engineering staff of the New York Central R.R., fabricated at Fort Pitt Bridge Works and erected by the Terry & Tench Company, New York, J. S. Peck, superintendent in charge. The work was done on a cost-plus-fee basis at a preliminary estimate of $62,000.

DELIVERY OF MATERIALS

Sand, broken stone and cement were delivered at the site on the low-level railroad tracks. The cement was stored in a water-proof shed adjacent to the bridge, which had a capacity of one carload. Sand and broken stone were received in open-top cars, shoveled by hand into wooden scale pans, hoisted by the erection derricks and dumped in small storage piles at highway grade close to the bridge.

The steel was delivered by rail to a storage yard about 1½ miles distant, and was hauled to the bridge site as required, loaded on a special truck drawn by four horses which, although the loads were comparatively light, were required to haul it up the heavy grade and to drag the truck through the soft soil at the storage yard.

The truck consisted of two ordinary, heavy, four-wheel wagons, each provided with a turntable bearing for the heavy pieces of steel, and connected at any convenient distance apart up to 25 feet or more, by a long wooden reach pivoted to both trucks. The tongue of the rear wagon was ordinary lashed to the reach, but when corners were turned it was unlashed and swung by hand to steer the wagon around the curve. This arrangement worked very well and was used for hauling a single heavy piece or several smaller pieces at a load; but on account of the absence of any storage place at the bridge site, the steel had to be lifted directly from the truck to position in the bridge and delays were necessary while the truck was gone for another load.

LOCATION OF OLD AND NEW TRUSSES

In the old structure the intermediate and outside trusses were spaced 18 feet and 25 feet respectively from the centre line of the centre truss, but in the new structure the centre and outside trusses remained in the same alignment, but the intermediate trusses were shifted 1½ feet farther from the centre, increasing the width of the roadway from 25 to 26½ feet, and reducing that of the sidewalk from 18 feet to 16½ feet.

The axis of the bridge is approximately north and south, and all of the new trusses were erected about 4 feet farther north than their final positions, with the north ends resting on crib work just back of the abutment wall and with the south ends resting on falsework bents set close to the face of the abutment wall, where there was clearance with the yard track.

PRELIMINARY WORK

Operations were commenced by diverting the traffic to the east roadway and sidewalk and removing the floor on the west roadway and sidewalk to give access to the old lower chords and floorbeams. The very hard concrete that encased these members was laboriously removed with bull points and jack-hammer drills, the latter operated by the contractor's compressed air plant.

The tops of the old abutments were cut away where accessible and replaced by concrete built up piecemeal as fast as the old masonry was exposed and removed. The new trusses were all assembled at an elevation about 2 feet higher than their final positions.

The west intermediate truss was first erected just clear of the old centre truss on the west side. The lower chord, in 3 pieces, was supported as already mentioned at the ends and at intermediate points was carried on blocking from the old floor beams.

DERRICK SERVICE

The centre section of the bottom chord, 33 feet long overall, weighed about 14 tons and was unloaded from the truck and put in position by the two erection derricks operating together. For this service there were installed two derricks with wooden stifflegs and sills with 80-foot booms of 12 tons capacity at a radius of 70 feet. The derricks were located in the middle of the street with their masts nearly in the axis of the bridge, and about 5 feet clear of each end of the centre truss.

To avoid obstructing the roadway, the sills of each derrick were supported on three wooden falsework towers, as shown in the illustration, providing a clearance of 16 feet over traffic. The towers under the feet of the stifflegs were enclosed and filled with paving stones to provide suitable counterweights. One of the derricks had a steel boom and the other a wooden boom, both of the same length and same nominal capacity and both equipped with bull wheels and operated by two double-drum, double-spool, steam hoisting engines located on a platform built on the derrick sills.

All of the concrete materials were unloaded by one of these derricks, which had a reach just sufficient to enable it to serve the cars on the yard track and deposit the materials at one end of the bridge. When it was necessary to deposit the materials at the other end of the bridge, this derrick delivered its load to the second derrick, which swung them to final position. One of the derricks was tested with the 14-ton middle section of the bottom chord of the centre truss. When it slowly lifted the latter, it just overbalanced the counterweights so that the stifflegs

commenced to rise, and the load was lowered back to the ground and afterwards was handled by both derricks together. Both derricks were equipped with seven-part topping lift wire rope tackles and five-part wire rope hoisting tackles, and connections to the heavy steel pieces were invariably made with wire rope slings, the ordinary hooks and clamps being used only for anchoring the derrick booms at night.

ERECTING NEW STEEL

For convenience, the trusses were lettered A, B, C, D, E, from west to east. Truss D was first erected in its first temporary position, riveted up and the temporary connections to the old floor beams were made. The old west floor plate was then removed and the trusses A., B., and C., were erected by blocking from the old floor beams, in their temporary positions.

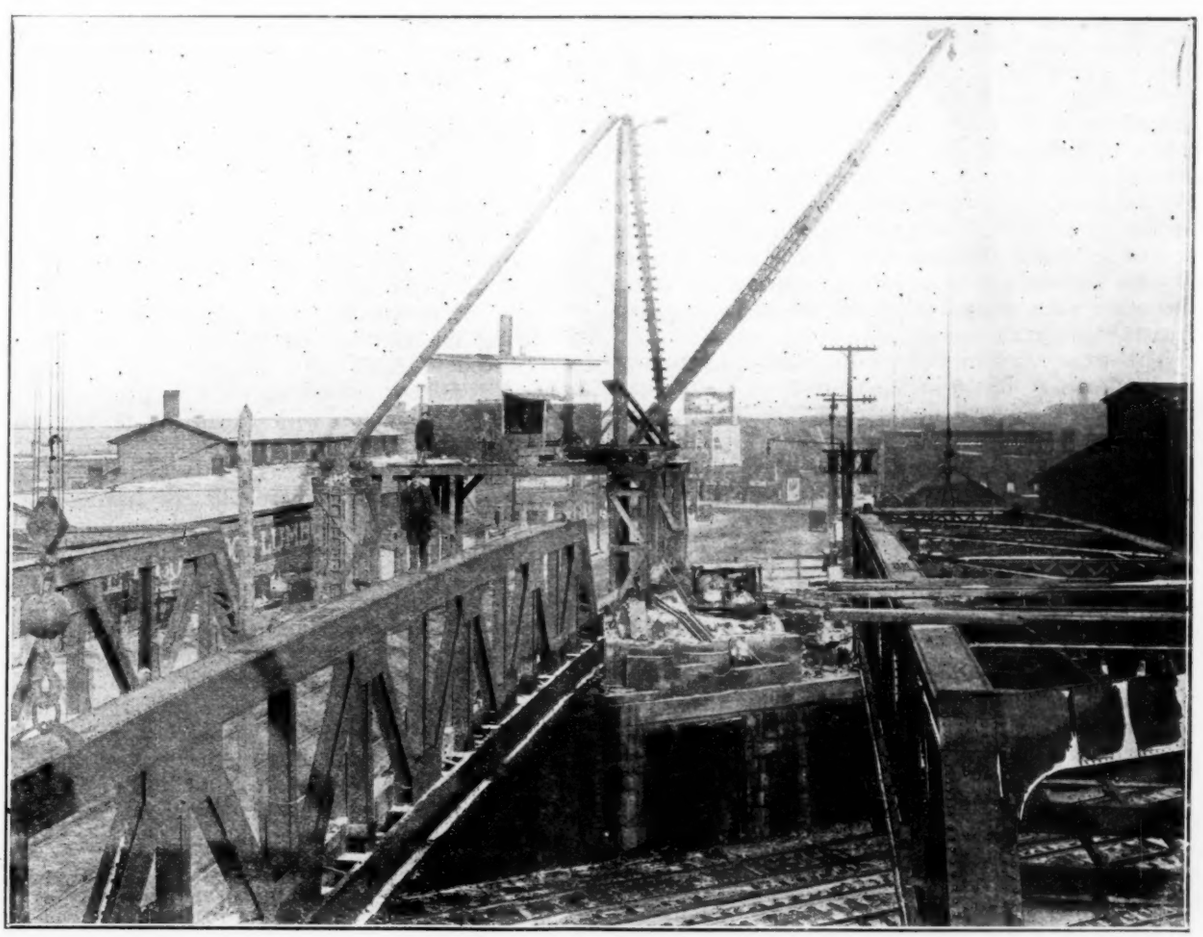
Trusses A., and B., were spaced 16½ feet apart centers, and about four floor beams and top laterals were bolted in place to provide against overturning. Truss C. was braced to truss B. by timber struts and wire lashings. Truss D. was braced to the old truss D. by using the old top lateral braces, bolted to the top chord.

Erection in all cases was started from the fixed end at the north abutment and continued across to the expansion end, the bottom chord being assembled first and then the web members and the top chord. The field joints of the trusses were then riveted up by pneumatic hammers and the camber blocks knocked out.

SUPPORTING OLD STRUCTURE

After the encasing concrete had been removed from the ends of the old floorbeams pairs of vertical angle brackets were riveted to their webs. These brackets were bolted to the flattened lower ends of a pair of vertical 1¼ inch screw rods with nuts at the upper ends, that took bearing on saddles supported by pairs of lateral 12x12 inch beams supported on the top chords of the new trusses. The nuts were screwed up to take the weight of the old floorbeams and lower loads, and the floorbeam connections to the old trusses were cut away. The old trusses themselves were lashed, at and between panel points, to the adjacent new trusses, and the old floor and old trusses were separately removed at convenience.

The truss members were cut off with oxy-acetylene flames close to the panel points, allowing the web members and chords to be removed in good-size sections. There was danger that the melted steel dropping from the torches would set fire to trains passing under the bridge, so that it was necessary to suspend torch operations whenever a train was underneath and two flagmen were kept on constant duty below the bridge, during working hours, to signal approaching and departing trains, thus interrupting the work not only during the passage of the trains, but afterwards during the time it was



NEW TRUSSES ALL ERECTED, PART OF FLOOR CONCRETED. WOODEN DERRICK ASSEMBLING BRACES

necessary to start a torch and heat the steel up to the melting point again. Notwithstanding these delays, the work progressed so rapidly that a truss could be cut to pieces and removed in about 2 days.

SHIFTING NEW TRUSSES

After the old centre and west side trusses had been removed, a 60 ton hydraulic jack was placed under each end of each new truss and they were raised slightly to permit the insertion under them of track plates made of pieces of old top-flange cover-plates removed for the purpose. Between the top and bottom track plates, there were inserted, at each truss, about a dozen small rollers made from short lengths cut from the 1 inch diagonal rods of the old trusses.

The trusses were lowered to bearing on these rollers and were pulled transversely about 3 feet by two steamboat ratchets attached to lines anchored beyond the bridge. The trusses were easily moved, and, after reaching their proper alignment, were again jacked up, the rollers turned 90 degrees and then moved longitudinally about 4 feet to the required position by a single steamboat ratchet for each truss. The trusses were then lowered to bearing in their final positions on the new concrete seats.

Truss C. was braced to truss D. and trusses A. and B. were moved as a unit. Truss C. was then moved to position by itself, being tied to truss B. and truss D. by tackles to prevent overturning. The floor beams and stringers were then assembled and riveted and the floor poured as stated.

When traffic was shifted to the new west roadway, the east floor was removed and truss E. erected in its temporary position. Truss D. was then moved from is first to its second temporary position, a distance of about 25 feet. This was the most critical point of the job, for the danger of overturning the truss was greater than on the shorter moves on the west side. The truss was braced by three sets of tackles to the new truss C. and the old truss D. The moving was done in the same manner as on the other side, great care being taken to keep the truss plumb at all times.

The truss was moved to its second temporary position, i.e. 16 feet 6 inches from truss E. in a day and a half. Several floor beams and top laterals were then bolted in place, as on the west side, and trusses D. and E. were then moved to their final position as a unit. This final move took about two days.

This moving of the trusses could not be done, of course, until the old trusses had been removed and the abutments remodeled.

FLOOR CONSTRUCTION AND PROTECTION

After floorbeams and stringers had been erected and riveted in position concrete forms were suspended from them, floor reinforcement was placed as required, and the floor slab was poured with concrete mixed in a Ransome "Bantam" machine installed near the abutment in the abandoned portion of the street and delivering to wheel carts that dumped the concrete directly into the form.s

After the concrete floor slab was 21 days old, traffic was shifted from the east to the new west roadway and sidewalk, and the east side of the old structure was replaced in substantially the same manner as the west side already desscribed.

The passage of trains underneath the bridge was a very disagreeable feature of the erection, especially since a feud developed between the roughnecks and the locomotive drivers and the latter took pleasure in blowing the high pressure blast, which, emerging from the smokestacks only 6 inches below the working scaffolds,struck them with such force as to frequently lift the scaffold boards several inches and of course filled the air with hot cinders and noxious gases, much to the discomfort of the bridge erectors, who responded by accidentally dropping various materials on the passing trains. The blast was so strong that it was necessary to always tie the scaffold planks firmly to their supports.

To protect the new structure from the locomotive blast, the under side of the concrete floor slab was covered, on the centre line of each of the six tracks, by a series of cast-iron plates, about 3 feet wide and in 6 or 8 foot sections, extending from end to end of the bridge.

These plates are provided on the upper sides with pairs of vertical lugs that match bent plates engaging the bottom flanges of the structure and forming corresponding lugs which like those on the plates are perforated with holes for pins that pass through both, and lock the lugs to the stringers thus supporting them in close contact with the concrete that is flush with the upper surface of the cast iron plates.

The pins pass through gas pipe sleeves provided to enable the former to be removed and the cast iron plates to be replaced, if necessary, without interfering with the concrete. As these plates were rather large and heavy and had to be placed under the bridge floor in the very narrow clearance over the tops of the trains, their erection was rather difficult and it was necessary to lower them by a sling attached to one end, then attach another sling to the other end and hoist them up into horizontal position and adjust them with some difficulty while the holes were made to register and the pins were driven through the pairs of lugs.

UNFAVORABLE COST CONDITIONS

During the erection of the bridge, which was commenced in April 1919, disagreements occurred between the labor unions, the local contractors, and the railroad company with which the bridge contractors were not identified but which seriously delayed the work and increased the scale of prices from $0.90 up to $1.25 per hour for Ironworkers, and from $0.55 to $0.65 per hour for common labor. These interruptions, the difficulty of getting materials, and other troubles greatly increased the estimated time for construction and the work is still in progress, although the erection has been completed and it only needs a few weeks time to finish the concreting of the east half of the floor and complete the contract. Except during the month of February and March last, the work has been constantly in progress since its beginning, with an average force of about 60 men, and has cost to date more than $100,000, which is a very excessive price for rebuilding the superstructure only of one short span which under favorable conditions, should have been much more quickly and cheaply erected. As it is, both the contractor and the railroad company have done everything possible to secure rapid and excellent work at the lowest possible cost.

Mud Holes and Road Drainage

The following, from the *Service Bulletin*, the monthly bulletin of the Iowa State Highway Commission, will apply equally well to a greater or less number of roads in almost every other state:

"The weather and road conditions of this season demonstrated more conclusively than for years before in Iowa that drainage is the most important thing in road building. It is not sufficient to provide side ditches for surface drainage only. The great amount of water in the soil this season has caused springy spots in road grades that had not broken through for years to soften up and turn into veritable quagmires. In such cases nothing short of tile of ample proportion in the road grade itself and sufficient lines of them can be expected to do any permanent good. There are spots where double lines of tile, one on each side of the road, have failed utterly to drain the grade sufficiently to allow the road surface to carry its traffic. The one rule to follow as to the necessity for tile drainage within the road grade lines should be when in doubt use tile and plenty of it."

Perhaps not many states, however, have adopted the same temporary remedy for mud holes:

"It has been years since Iowa has had as many plank roads as she has today. Probably very few counties have gotten this far through the year without having mud holes which it has been utterly impossible to make passable without laying board paths for the car wheels. In the immediate vicinity of Ames on two of the main roads where drainage has been taken care of in the ordinary fashion with side ditches and which for several seasons have given no trouble, it has been necessary to bridge over the spots with plank pathways. Sleepers were laid upon the mud and upon these two lines of 2x12 boards, two planks wide, making a path two feet wide for each side, were laid. The most extensive road of this kind so far reported comes from Marshall county, where the stretch of bottom road south and west of Lamoille was planked for several hundred feet. Planking road in Iowa today seems like a rather primitive way of road maintenance but it was probably the only method possible for making some stretches of road passable for cars."

Comparative Value of Timber Cut From Live and Dead Trees

Prejudice exists in certain quarters against the use of timber cut from dead trees, and some purchase specifications insist that only timber cut from live trees will be acceptable. This prejudice is unjustified, in the opinion of the Forest Products Laboratory of the United States Forest Service. The laboratory officials make the following statement on this point:

As a matter of fact, when sound, dead trees are sawed into lumber and the weathered or charred outside is cut away, there is no method known to the Forest Products Laboratory by which the lumber can be distinguished from that cut from live trees, except that the lumber from dead trees may be partly seasoned when sawed.

All the information available at the laboratory indicates that timber cut from insect or fire-killed trees is just as good for any structural purpose as that cut from live trees of similar quality, providing the wood has not been subsequently injured by decay or further insect attack. If a tree stands on the stump too long after it has been killed, the sapwood is likely to become decayed or badly infested by wood-boring insects; and in time the heart-wood also will be similarly affected. The same thing is true of logs cut from live trees and not properly cared for. Until the wood becomes affected by these destructive agents, dead-tree wood should be just as strong and just as durable as sound, live-tree wood.

In considering the subject, it may be useful to remember that the heartwood of a living tree is entirely dead, and in the sapwood only a comparatively few cells are living. Most of the wood cut from trees is dead, therefore, regardless of whether the tree itself is living or not. Such being the case, purchase specifications, instead of providing that material must not be from dead trees, should state that material showing evidence of decay or insect infestation exceeding a specified limit will not be accepted.

County Takes Highway Contract

On June 1 Hamilton County, Tenn., through its County Judge and Highway Commission, signed a contract to build 10,143 miles of concrete road. The contract price was $340,000. This contract is for a part of the Chattanooga-Dayton Highway. The concrete is to be 16 feet wide, in addition to which there will be chert shoulders. The county has already contracted for the necessary machinery.

County Engineer Merrill will have direct supervision of the work. He has contracted for 37,000 barrels of cement, 15,000 cubic yards of gravel, 10,000 cubic yards of sand, $2,000 worth of iron pipe, a mixer costing $6,650, and a pump costing $1,650. He expects to use, for carrying the aggregate, a number of motor trucks which have their bodies divided into four compartments, each containing material for one batch. Other labor-saving devices will be used, so that it is believed not more than 50 men will be employed on the work. We are indebted for this information to the Chairman of the Hamilton County Board of Highway Commissioners, P. H. Thach.

Water Meters In Detroit

On July 1, 1916, there were in Detroit 46,991 meters in service, and on July 1, 1919, the number had been increased to 127,192, making 96.16 per cent of all used services metered.

In this connection it is interesting to learn from the latest annual report of the Board of Water Commissioners that, for the year beginning July 1, 1916, the total amount of water pumped into the distribution system was 52,040,254,250 gallons, while during the year ending June 30, 1919, in spite of the increase in population, the amount pumped had fallen to 48,716,817,350.

Of the total number of meters at the latest report, 119,088 were ⅝-in. or ¾-in. meters. These

were of ten different makes, although only five of them were represented by more than 1,000 meters each.

Figures for the cost of repairing meters damaged by hot water during the latest fiscal year show that 4,143 were so damaged and that the repairing of them cost $1,011 for material and $8,020 for labor. For 5/8-in. meters the average cost for labor was $1.85 and for material was 20 cents. During the same year 1,587 meters were repaired because of damage by frost and 4,936 because of general wear and tear. The cost of repairing these meters averaged $1.62 for labor and 20 cents for material.

During the year the cost of installing 5/8-in. meters averaged $7.05, of which $6.70 was for material and 35 cents for labor and carting. During the year 35,954 5/8-in. meters were tested at an average cost of 6 cents per meter. In addition, 7,151 larger meters were tested at costs up to $3.80 for an 8-in. meter.

East Hartford Waterworks Extension

Design and construction of supplementary plant increasing supply from 1,750,000 gallons to nearly 3,000,000 gallons per day by building two covered settling basins, low diversion dam, chlorinating devices and 6.2 miles of 16-inch supply main, thus providing a nearly automatic service for a population of 25,000 for about $320,000 contract price.

The East Hartford Fire District is an independent municipality with a present population of about 9,000, which is located on the opposite bank of the Connecticut river and about two miles from the city of Hartford. It has a separate high-pressure gravity system water supply, the first part of which was built about 1890 and derived about 500,000 gallons per day from the 1,500,000 gallons estimated run-off of the 1.37-square-mile watershed of the east branch of Salmon brook. As this brook furnished a continuously adequate supply, no storage reservoir was provided, and the water was taken from above a small diversion dam and carried in a 14-inch main through the town of Glastonbury, which it also supplied, to East Hartford, through a system of about 45 miles of supply and distributing mains.

This supply sufficed until about 1910, when the fire district acquired the north branch of Salmon brook with a watershed of 2½ square miles, a supply from which was connected to the old main by a 12-inch pipe running into a distributing well near the east branch, where a small settling basin was provided. No storage reservoir was built because it was the policy to acquire stream rights first, and to use the run-off of streams as long as it was abundantly adequate.

In 1914 the supply had been extended to serve a considerable number of mills and manufacturers and began to be inadequate for the requirement of 1,750,000 gallons per day. Attempts were made therefore to acquire additional supply from Cold brook, the south branch of Roaring brook, which is located four miles south of Salmon brook in the town of Glastonbury. To secure these rights, it was found necessary to appeal to the court for the condemnation of some of the property of four principal mill owners; two of whom agreed on the compensation while the other two refused, so that litigation was necessary and the rights were finally secured at a total cost for purchase expenses and litigation of about $80,000.

The system and its extension had for several years been in charge of C. Henry Olmsted, now city engineer of East Hartford, and when the Cold brook extension was contemplated, J. H. Fuertes, consulting engineer, New York, was retained and since that time has been associated with Mr. Olmsted in the extension of the system, took part in the condemnation proceedings, and prepared the plans and specifications for the additional plant which is now under construction.

GOVERNING CONSIDERATIONS

As the stream flow of Salmon brook and Cold brook combined will suffice without storage to supply the requirements of East Hartford and its dependencies for several years, not only was the provision of a storage system unnecessary but its operation, impounding the running water for a considerable period, would so change the character of the water that some form of treatment for it would be required to prevent the development of objectionable odor or taste that might appear if the water was impounded in the shallow storage that would be more available and less costly than storage deep enough to prevent these changes. At present, with proper precautions regarding contamination, such treatment is not required and it was possible to design and construct a simple and efficient system, at minimum cost, which for several years will provide adequately for the requirements of the city with very small operating charges.

The present plans, therefore, provide for taking the water directly into the diversion works, and distribution system, and are so developed that muddy water (following storms) and water that may be temporarily objectionable on account of disagreeable odor or taste, can be by-passed and the reservoirs washed out. The brooks clear up very rapidly after a storm and as they are not necessarily both muddy simultaneously, a limited storage suffices to supply the city during the 24-hour intervals in which it may be desirable to waste the flow

from the brooks, and this amount of emergency supply is provided by the small receiving reservoirs at the heads of the mains.

Although the reservoirs are at different elevations, both are used for the supply through the same old mains, and are connected through a 12-inch Ross automatic reducing valve which reduces the pressure from the high level reservoir a few pounds—sufficient to prevent the possibility of the water from this reservoir overflowing through the low level reservoir during the night, when the attendant is not present.

AUTOMATIC CONTROL OF CHLORINATION

In order to remove any possible contamination of the water, chlorination is automatically effected at each reservoir and is controlled by the rate of flow, into each reservoir, of the supply water through a 10½-inch diameter orifice, at which sufficient difference of level will be produced on opposite sides of the orifice plate to operate the differential apparatus that regulates the dosage of chlorine; a requirement that is made necessary by the very wide variation between the amount of water consumed at hours of maximum draft and that consumed at hours of minimum draft, for without such provisions, the water would either be too much chlorinated when the draft is small or too little chlorinated when it is great. This enables the water to be used without the intermediate storage time which, if long enough continued, would act through natural operations to eliminate bacteria entering the storage.

RESERVOIR ROOFS

The reservoirs are covered to avoid the formation of ice, to exclude sunlight, and to maintain a more even temperature, giving cooler water in summer. The flat slab roof was adopted because the bottom of the reservoir is in compressible material, where the settlement of columns supporting groined arches might have a serious effect. The flat slabs give a satisfactory and substantial structure and are cheaply and quickly constructed.

It is believed that the system as now constructed will afford an excellent and reliable water supply for a minimum cost of construction until the present population is doubled, and that there will be involved no additional cost over the present expense of operation.

PRESENT AND FUTURE SUPPLY

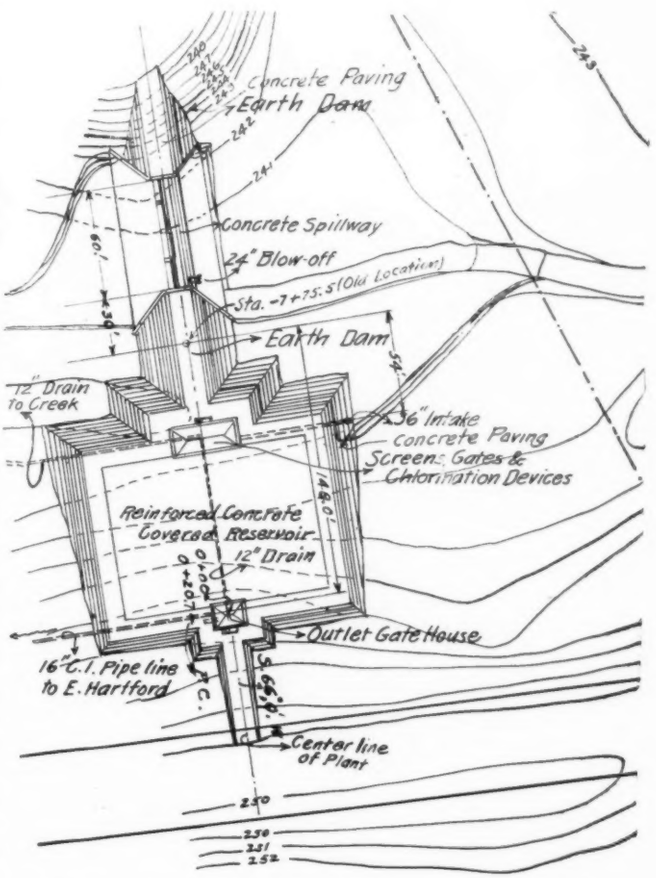
In September, 1919, a contract was awarded to the Beaver Engineering & Contracting Company, New York, to build the additions, comprising a low, reinforced concrete diversion dam on Cold brook, reinforced concrete reservoirs on Salmon brook and on Cold brook, to install a chlorinating apparatus at each reservoir, and to lay about 6.2 miles of 16-inch cast iron supply main from Cold brook to Glastonbury, to connect with the East Hartford fire district street mains there. This contract was awarded on the unit basis with an estimated total of about $320,000.

It is expected to provide a present supply of about 3,000,000 gallons daily from the regular run-of-stream without impounding reservoirs, which will afford abundant supply for the present needs of East Hartford, Glastonbury, the small manufacturing village of Burnside, and the town of South Windsor, which have a present combined population of about 25,000. This supply can be doubled by the construction at any time, for a moderate cost, of a storage reservoir, which will involve the building of a dam 40 feet high and about 500 feet long, affording sufficient provision for the probable increase of population and demands for at least 15 years.

DESCRIPTION OF RESERVOIRS

The Salmon brook reservoir, adjacent to the old settling basin, originally of about 2,000,000 gallons capacity, but now silted up to a capacity of probably not more than 1,500,000 gallons, is at the head of the old 14-inch supply line to East Hartford; a gate house and screen chamber being between the new reservoir and the old settling basin. The soil at the site consists chiefly of clean sand and gravel, well adapted for concrete aggregate, with a generally level surface. This was excavated to a depth of about 8 feet, forming a pit in which the rectangular reinforced concrete reservoir about 83 feet wide and 114 feet long is now under construction.

The reservoir has a 6-inch horizontal slab floor and, instead of the usual groined arch roof, has a 5-inch roof slab supported on 6 x 8- inch beams, 4 feet 7 inches centers, and 12 x 14-inch girders carried by the 12-inch exterior and center partition walls, and on rows of 12 x 12-inch columns 13 feet 9 inches and 13 feet 8 inches apart on centers. It will be covered by an earth fill 2 feet thick and it



GENERAL PLAN OF COLD BROOK DAM AND RESERVOIR

has, at each end of the partion wall (which divides it into duplicate 54 x 81-foot chambers 10½ feet high in the clear), an inlet and outlet gate house, 14½ x 24 feet and 12 x 15 feet respectively.

The Cold brook reservoir, about 4 miles distant from the Salmon brook reservoir, is of similar construction and dimensions, but the clear depth between floor and roof slabs is only 8½ feet.

This reservoir forms part of a composite structure which extends across the valley of the brook, a total distance of about 375 feet at the lower end of 8-acre settling basin. This structure consists of an earth dam, a part of which surrounds the concrete covered reservoir, which is nearer the left bank; also a concrete spillway interposed in the earth embankment and nearer the right bank. The earth embankment which is 60 ft. long, is 6.5 feet high, except that 14 feet of this length is 6 inches lower, or about 6 feet above the bed of the creek.

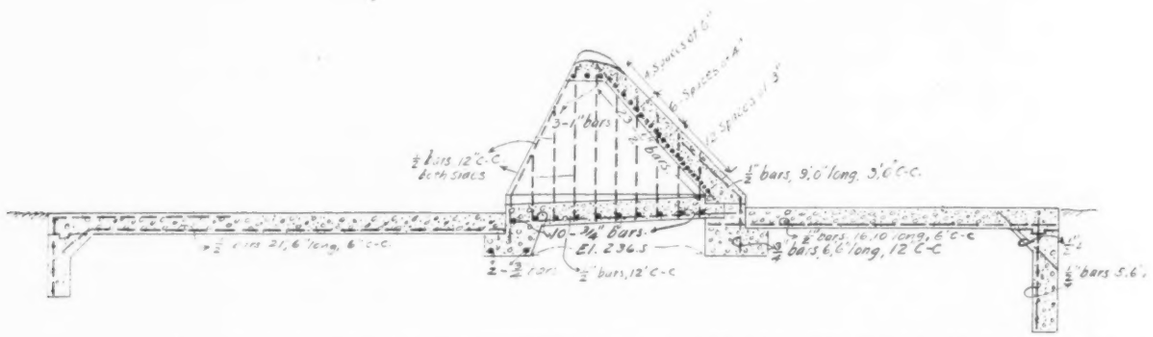
SPILLWAY

The spillway is built of reinforced concrete in the form of an inclined slab 12 inches thick, at the top and 18 inches at the bottom, having the lower edge integral with a horizontal foundation slab 12 feet wide and 12 inches thick. The inclined slab is supported on transverse vertical buttress walls 12 inches thick and 15 feet apart on centers. The horizontal slab is extended upstream and downstream by aprons respectively 15 feet 3 inches and 22 feet wide, integral with vertical cut-off walls 6 feet and 4 feet deep at the upper and lower edges. The ends of the concrete spillway terminate in concrete wing walls which protect the earth embankments 57 feet and 65 feet in length, which connect it with the hill on one side and with the reservoir on the other. The third embankment 55 feet long extends from the reservoir to the hillside. Work on this structure has not yet been commenced except for the clearing of about 14 acres, including and adjacent to the reservoir site.

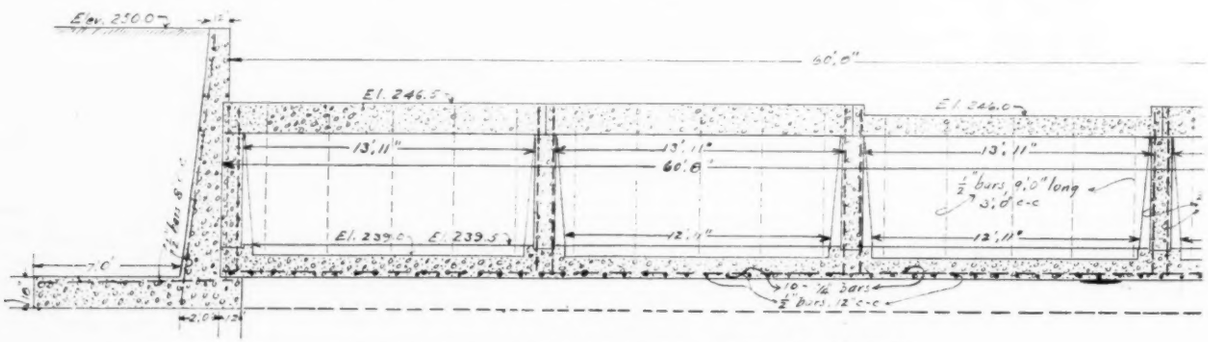
RESERVOIR CONSTRUCTION

About 2,000 yards of sand and gravel were excavated by scrapers and by two clamshell buckets operated by stiffleg derricks at the site of the Salmon brook reservoir. The sides of the pit were left at the natural slope and the materials were stored on top of the bank adjacent to them ready for use in back-filling over the top of the completed reservoir. No difficulty was experienced in excavation excepting where a small amount of quicksand was encountered and easily handled by the aid of hand diaphragm pumps operated in 3 x 3-foot sumps 2 feet deep, which quickly drained the soil and enabled it to be handled readily.

The sand and gravel, of excellent quality, were used for aggregate in the 1:2:4 concrete, mixed in a ½-yard Ransome machine installed on the bank near the foundation pit and delivered into 2-wheel Ransome carts operated on runway platforms built around the four sides of the reservoir and parallel to the dividing wall. The carts dumped into short sections of steel chutes, which conveyed the concrete to the required position on the floor and in the wall and column forms. The reinforcement, of both twisted and deformed bars, was assembled, wired together, and erected in position for the walls before the forms for the latter were set enclosing them. The forms were made up of large wooden panels about 10 feet by 12 feet, which were used three times and carefully cleaned and oiled after each use. It is estimated that the cost of the forms amounts to about $20 per cubic yard of all the concrete in the reservoir. The average number of men at work at the reservoir was about 30.



CROSS SECTION OF SPILLWAY SHOWING WIDE CONCRETE APRONS AND CUT OFF WALLS AT UP AND DOWN STREAM EDGES



PART ELEVATIONS OF COLD BROOK CONCRETE SPILLWAY

PIPE LAYING

The 16-inch pipe is delivered at Hartford by boat, and thence transported on automobile trucks and delivered along the line by a sub-contractor. Considerable difficulty has been experienced in securing deliveries on account of the congestion and interruption of freight service that has caused the work to be suspended at intervals.

The pipe line closely follows the hydraulic grade, and enables the system to provide a maximum effective head of nearly 200 feet in the lowest portions of East Hartford. The pipe trench has a minimum depth of about 5½ feet to provide for the required cover of 4 feet. The greatest depth is 22 feet and the excavation, amounting to about 24,000 yards, is mostly loam, sand and gravel with about 500 yards of rock and boulders that require drilling and blasting with black powder before removal.

A large part of the excavation is made with an Austin machine operated by four men, that digs a trench 30 inches wide at an average speed of 400 linear feet per day, with a record of 600 feet in 8 hours. Most of the material is so firm that the sides of the trench stand vertical without sheeting or bracing, care being taken to lay the pipe as rapidly as possible in the rear of the machine so that only a short section of the trench is left open. In some cases the ground is so hard that it is shattered with charges of about one-half stick of dynamite in center line holes 6 or 8 feet apart before excavation.

The pipe is handled in the field by tripods and hand tackles and is laid and jointed in the usual way with great care to secure solid support and tight joints. The back-fill is placed by an Austin machine operated by two men (although it can be handled by a single man), which does the work at an estimated cost of about 5c. per linear foot. The pipe laying force has varied from two to eight gangs, according to the amount of pipe available.

In the winter, when the ground was frozen hard, it was found advantageous to excavate the trench by hand in sections 5 feet deep and 8 feet long, leaving intermediate sections 4 feet wide between them through which a hole was tunnelled in the bottom large enough to permit the pipe to be thrust through and joints to be made in the open trench. In this manner a gang of 15 to 30 men excavated 200 linear feet of trench per 8-hour day.

PRINCIPAL QUANTITIES

The principal items of this contract for constructing the reservoirs, gate houses, dam, settling basin and pipe line include 8,900 yards of stripping and excavation, 4,600 yards of embankment, 1,725 yards of concrete, 24,813 linear feet of 16-inch cast iron pipe, 74 6-inch to 16-inch gate valves, 26 fire hydrants and 1,060 linear feet of 12-inch vitrified sewer pipe. It is estimated that on June 1st the contract was about 30 per cent completed.

Underground Roads For Automobiles

An underground system of roads for automobiles to relieve the growing traffic congestion in London was predicted by Lord Ashfield of Southwell in a speech at the American Luncheon Club. These roads could be connected with the outer districts of the metropolis by a system of boulevards to be reserved exclusively for motor traffic.

London is today the greatest riding city in the world, according to Lord Ashfield. Roads capable of dealing with 375,000 motor cars must be provided soon. He also predicted an increase in the number and size of underground railways in London.

No New Highway Work In California

State Highway Engineer A. B. Fletcher of California has stated that after 1920 no new work will be undertaken in that state. This decision is based on the unsalability of the state bond issue and the high cost of construction.

New York and Illinois have already postponed highway work until conditions are more favorable. The state auditor of Ohio has recommended the suspension of work in that state for the same reasons.

Payment For Estimating

In October, 1919, the American Institute of Architects, Engineering Council, and Associated General Contractors of America, each appointed three conferees to discuss the matter of payment for estimating. These conferees agreed upon a report which was submitted to their respective organizations under date of February 17, 1920, and has since been under consideration by them. Engineering Council at its meeting on June 17 adopted the conclusion on recommendation of a special committee, to which the report of the conferees had been referred, the wording of the action of the council being as follows:

"Whenever in the execution of work, competitive bids are asked for on detailed plans and specifications, those invited to bid should be provided with such an estimate of the quantities involved in the work as the surveys, plans and specifications permit to be made. The intent of this requirement is that single estimate of quantities should be made by or for the engineer, architect, or other representative of the owner, so that each separate bidder will not be put to the expense of making up a separate schedule of estimates. This latter practice not only means a needless waste in the carrying on of the contract work, but also discourages bidders and causes needless repeated handling of official plans and specifications in making up separate schedules of estimates."

National Trucking Association

Representatives of motor trucking firms from all parts of the United States held a conference in the Hotel La Salle, Chicago, on June 26 and 27, to organize a national association to deal with the problems of long-distance trucking.

Among the questions discussed were the construction of highways powerful enough to withstand the heavy loads, study of automotive constructive elements, research in operating costs and equalization of loads, problems connected with the necessity for co-operation between commercial haulers in different cities, in order to keep trucks supplied with return loads from long distances and many other matters vital to the industry.

Representatives from New York, Iowa, Michigan, California, Pennsylvania, Ohio, Indiana, Missouri, Massachusetts, Nevada, Texas, Colorado, Oregon, Illinois, Louisiana, Nebraska and other states were in attendance.

American Water-works Association Convention*

Conclusion of Narrative of Convention begun in last week's issue. The papers and discussions of Thursday—"Superintendents' Day"—are referred to in this instalment.

THURSDAY SESSIONS

Thursday was set aside as Superintendent's Day, to be devoted to papers and discussions of a practical nature. During the morning and afternoon, the Chemical and Bacteriological Section held sessions in an adjoining room. As already described, the main sessions were broken in upon by somewhat protracted discussions resulting from the reconsideration of a motion adopted the previous day relative to a proposed change in the constitution governing the method of selecting a secretary.

Owing to the unfortunate absence of Caleb M. Saville, who was chairman of the Committee on Standard Specifications for water meters, no formal report of that committee was made but merely one on progress.

Discussing "The Proper Size of Meter for Multiple-family Houses," H. P. Bohman described the system employed in Milwaukee. Here the regulations required the meter to be the same size as the corporation cock, and the minimum size now used for this is ⅝ inch, although there are in service quite a number of smaller sizes which were installed some years ago. G. A. Elliott reported that in San Francisco a ⅝-inch meter was used for any number of families up to 6, a ¾-inch meter for 7 to 10 families, etc. D. W. French, describing the practice of the Hackensack Water Company, which supplies a number of communities in New Jersty, stated as his opinion that no fixed rule for size of meter was practicable, since this would be influenced by the pressure in the mains and other conditions. They used meters as small as ½-inch for two-family houses, a ¾-inch meter for 5 to 10 family houses, etc. W. R. Edwards, assistant superintendent of the Passaic Water Company, which also supplies a large number of New Jersey communities, stated that that company uses ⅝inch meters for houses containing up to 6 families and ¾-inch meters up to 12 families. A. W. Cuddeback, engineer and superintendent of the Passaic Water Company, believed that a meter should be large enough to give good service, and gave it as his experience that a half-inch meter would not do this for even one family. J. N. Chester and others also spoke on this subject, Mr. Chester advocating abundant size in meters so that dwellers on the upper floors of residences and apartments could obtain water while it was being drawn for washing or bathing on the lower floors. One member reported that a 6-inch compound meter was found to register only about half the consumption because the prevailing rate of consumption was just at the critical point between the two meters, and the income from the service was increased by 80 per cent by changing to a smaller meter. One superintendent reported that he found in too many cases that the stop and waste valve in the cellar was too small and reduced the pressure, while others referred to the fact that a ⅝-inch or ¾-inch corporation cock has not really a passage of that size, and that this and too small service pipes reduced the pressure more than did the meter. W. H. Buck reported that in Riverton, N. J., no service less than one inch was allowed, except that ¾-inch was permitted if lead pipe were used.

A paper on the "Standardization of Water Works Supplies" was read by Adolph Mueller, in which he reported that the manufacturers of water works brass goods were arranging to standardize such goods and reduced the numbers of patterns by about 75 per cent. This should not only reduce the amount of stock and number of tools which it was necessary for the manufacturers to carry, but because of this should make it possible to reduce the cost somewhat for the purchasers. Among other things he expressed the hope that a ⅝-inch or ¾-inch cock under the new standard would be an "honest-to-God" appliance giving a waterway of the size named, and that this should be given the proper shape to minimize friction losses. Following Mr. Mueller's paper, it was voted to appoint a committee to confer with the committee of the brass goods manufacturers and with a similar committee of the New England Water Works Association.

The afternoon session opened with a paper by C. R. Knowles entitled "The Prevention of Water Waste on Railroads." This paper was illustrated by lantern slides showing horrible examples along the lines of the Illinois Central Railroad. By educating the employees to less wasteful practices, the company had been enabled to decrease the consumption by 18 per cent.

John Murphy, of Ottawa, then gave a very interesting talk on ice formation, illustrated by lantern slides, including moving pictures showing the formation of ice in a glass beaker. The amount of heat, said Mr. Murphy, required to prevent the formation of ice was very slight compared with that required to melt ice after it has formed. If the temperature of the metal in a water wheel or in screens can be kept a minute fraction of a degree above 32 degrees, the water will not freeze to such objects, even though the temperature of the water be slightly below freezing. He cited an instance where a factory discharging a comparatively small amount of warm water into a Canadian stream, it being estimated that the amount of warm water was not more than 1-500 of the volume of the stream receiving it, prevented the formation of ice, although in former years an ice company had every winter cut heavy ice on this stream a mile or two lower down. Because of this the ice company

*Concluded from the July 3 issue, page 8.

brought suit against those who were discharging the warm water into the stream and proved its case. The moving pictures showed a beaker full of water a very little below freezing temperature, but containing no ice. Stirring this with a rod, frazil or needle-ice was seen to form and float to the top, the same occurring when agitation was effected by moving up and down rapidly an iron nut suspended from a string. An iron bar at a temperature slightly below freezing was inserted in the water and ice was seen forming around it. It was believed to be demonstrated by this experiment that the formation of ice required more or less agitation or else a nucleus created by a body whose temperature was below freezing. Illustrations were shown of iron casings of water wheels and other iron objects which contained hollow passages through which warm water was kept moving during freezing weather, which entirely prevented the formation of ice around such objects, although in previous winters their operation had been interfered with and some times entirely prevented by such formation.

Following this Dr. Gellert Alleman read a paper entitled, "Some Aspects of Electrolysis." He stated that there was no cure-all for electrolysis, but that almost any condition could be remedied by the application of one of several accepted methods, although under other conditions such method might be far from satisfactory.

"The Revenue Chargeable to Public Uses of Water in the City of Rochester," by Stephen B. Storey, was the first paper of the evening session, Mr. Storey going quite fully into the practce of the water company in Rochester and calling attention to some items of public use for which the water department was not credited by the city. His method of determining the amount which the city should be credited for fire protection, namely deducting from the total cost of the plant the cost required for providing all services other than fire protection, brought forth the remark from one member that he thought a more just method was to apportion the entire cost in proportion to the cost of a plant designed for either purpose alone, while another member stated that he would simply reverse the method described and would base the fire protection cost on the cost of a plant designed for fire protection only.

This paper was followed by one entitled "Damage to Deep Wells by Sea Water," by Dr. William P. Mason. The paper dealt with an investigation made by Dr. Mason to determine whether damage would be done to the wells of the Queens County Water Company should a canal be excavated from Jamaica Bay to the Great South Bay passing within a thousand feet of the nearest well by one route and fifty feet by a second route. As to the second route, there was no question at all but that salt water would reach the well. As to the thousand feet, Dr. Mason did not feel certain, but after investigating the data available and considering the nature of the ground, which is pure sand, and that his investigations led him to believe that a well which had once been ruined by the accession of salt water never recovered, he reported that there was danger that the construction of the canal would ruin the wells and thus entitle the water company to considerable damages. Two or three other members questioned Dr. Mason's opinion that a well once salt never recovered, by citing instances where such recovery had taken place.

The Associated General Contractors of America, through one of their members, made to the society a plea for the adoption of modifications in contracts as now in common use, presenting the standard paragraphs which they desired, which were published in PUBLIC WORKS of June 5.

Leonard Metcalf presented a paper entitled, "The War Burden of Water Works in the United States Continues," in which he presented figures supplementary to those given to the society last year, showing that prices of materials and services used by water companies were on the whole greater even than a year ago, that there was no immediate prospect of any considerable reduction in them, and that consequently cities and companies which had not already done so might still find it necessary to increase rates; certainly, some increase in revenue must be necessary to meet the continued high cost of the services rendered.

Segregating City Traffic

Providing for a two months' test in Cleveland of the practicability and results of prohibiting heavy vehicular traffic on certain streets, favoring rapidly moving vehicles thereon.

We have received from Robert H. Whitten, special city plan advisor of Cleveland, information concerning recent action taken by that city, Mr. Whitten having been led to send it by an editorial published in PUBLIC WORKS of May 22.

The information sent consists first of a report by Mr. Whitten and Frank R. Walker, as city plan advisors, in response to a request by the city council for advice relative to "the feasibility of prohibiting traffic on certain newly paved main thoroughfares in the city of Cleveland, with special reference to eliminating heavy vehicular traffic from operating in Franklin Avenue." The remainder of the material forwarded consists of the ordinance adopted, providing for a two months' test of the recommendation contained in the report, the ordinance providing that under rules to be promulgated by the director of public safety, for limited periods not exceeding 60 days heavy vehicular truck traffic shall be barred from five specified streets; provided that vehicles making deliveries of goods and merchandise may be permitted on these thoroughfares, but such vehicles must enter and leave the thoroughfares by the nearest intersecting streets. Also, it was provided that, on the conclusion of this test, the Director of Public Safety report to the council showing the results of it.

The report of the city plan advisors is so general in its applicability, that we quote it entire in the following paragraphs:

"Where there are two parallel thoroughfares serving the same general section of the city, it is

in some cases highly desirable from a traffic standpoint to use one of these thoroughfares primarily for fast moving vehicles and the other thoroughfare primarily for trucks and other commercial vehicles. Such a segregation of traffic will increase the traffic capacity of both thoroughfares.

"In New York City portions of a number of principal north and south thoroughfares such as Fifth avenue, Park avenue, Fourth avenue, Seventh avenue and Broadway are now reserved primarily for the use of automobiles. Commercial vehicles may not enter these thoroughfares except to receive or deliver goods. This regulation has been in force over a year and is said to have worked well.

"In Cleveland the thoroughfares that could most appropriately be reserved for automobile traffic are: Carnegie avenue from East 71st street to East 100th street; Wilbur avenue from East 100th street to East 107th street. Fairchild avenue from East 107th street to Stearns road; Franklin avenue from Franklin circle to West 85th street; and Lake avenue from Clifton boulevard to West 117th street.

"Trucks that use Franklin avenue can be routed without great inconvenience through Detroit avenue, Lorain avenue or Madison avenue. Trucks that use Lake avenue can be routed through Clifton boulevard or Detroit avenue. Trucks that use Carnegie avenue, Wilbur avenue and Fairchild avenue can be routed through Cedar avenue.

"The roadway on Cedar avenue east of East 89th street has recently been repaved and widened. The pavement in the car tracks from East 55th street to East 89th street is in good condition and the pavement between the car tracks and the curb in fair condition for trucking though the roadway is narrow. This portion of the roadway should be repaved and widened. On East 55th street the pavement is in good condition from Euclid avenue to Carnegie avenue but should be repaved in the block from Carnegie avenue to Cedar avenue so that through trucking would be induced to turn down East 55th street to Cedar avenue.

"The restriction should probably apply to all motor vehicles constructed or specifically equipped for the transportation of goods, wares or merchandise and should apply to all horse drawn vehicles. Exception should of course be made in favor of fire apparatus, ambulances, U. S. mail, city department vehicles and emergency repair cars of public utility corporations. There should also be an exception in favor of vehicles receiving goods or making deliveries or transacting any other business along the restricted thoroughfare. In order to prevent the abuse of this privilege, such vehicles should be required to enter and leave by the nearest intersecting thoroughfare. If, however, they are receiving or delivering goods at a number of places not more than half a mile apart, they should be permitted to pass along the restricted thoroughfare between such stops.

"It is believed that a start in traffic segregation on the avenues above specified will be distinctly advantageous in improving traffic conditions. The present mixture of traffic, especially on Carnegie avenue, leads to congestion and results in numerous accidents. Traffic is becoming heavy on Franklin avenue and the restriction as here proposed will prevent the development of traffic conditions similar to those now obtaining on Carnegie avenue.

"In order to make a traffic segregation ordinance effective conspicuous notices should be placed at all important intersections along the restricted thoroughfares. In addition it will probably be necessary, for a time at least, to have one or more motorcycle policemen assigned to the enforcement of the ordinance."

Tunnels Under the North River, New York

Regarding the practical conditions fully established by shield-driven tunnel construction under the North and East rivers, New York, specific statements recently made by John F. O'Rourke are very pertinent to some of the points that have been disputed in recent discussions of the proposed Hudson River Vehicular Tunnel.

Mr. O'Rourke wrote, not in controversy, but as a matter of personal knowledge:

"Wherever the river bed is soft along the line of the tunnel for a distance down that would not leave enough hard material to hold the air and leave solid ground around the tunnel, that the only thing necessary to do would be to drop heavy clay some time before the shield would reach the place, in a wide mat.

Our experience shows that heavy clay invariably displaces the light, soft clay and unites with the hard clay below, so that the tunnel can always be kept in solid ground. This clay cuts like cheese, and holds its form for some time, so there is no difficulty in packing the space around the tunnel lining with gravel, thus holding the ground without movement and the tunnel lining in position and form as set. This should dispose of all questions in regard to extraordinary stresses in the tunnel lining and produce a situation the same as existed in the Pennsylvania tunnels about a year after the cast iron lining had been placed. As stated by myself, Fitzgerald and others, the river bed had closed around the cast iron lining by that time, and such braces or tie-bars as had been put in the tunnel were taken out and the ground outside produced no effects whatever on the lining."

Forest Products Laboratory Decennial

We are requested to extend a general invitation to all who are interested, to attend the decennial celebration of the Forest Products Laboratory which will be held at Madison, Wis., on July 22 and 23. On the afternoon of July 23 there will be held a conference of representatives of various wood using industries and the question of national forest policy will be discussed. Further information can be obtained by addressing Don E. Mowry, Cantwell Building, Madison, Wis.

The laboratory is operated as a branch of the Forest Service of the U. S. Department of Argiculture, in co-operation with the University of Wisconsin. It is an institution of industrial research devoted to the study of the properties and economic uses of wood.

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Providing For Increasing Water Supply

In planning for gravity water supplies, it is of course necessary that allowance be made for a future consumption considerably greater than the present. In fact, an eye should be had to an almost indefinite future, since through all time, it would seem, the city must obtain a supply of water proportional to its population. This applies to the amount of water obtainable, but not necessarily to the works for developing and transporting all of it.

Where provision for the future involves the securing of several sources of supply, no one of which would be sufficient, probably the more common practice is to develop some one or two sources to the limit. The other plan would be to make a partial development of all of them. This was the one adopted by East Hartford, Connecticut, as explained elsewhere in this issue, the conditions as to stream flow being such that practically no storage is required at present to insure a continuous ample supply.

Where storage in any volume is called for, however it will generally be most economical to develop to the full some one supply, rather than build a low dam now and later add to its height or build another higher one lower down. The deciding element of the problem will ordinarily be the expense, and this should be studied carefully, a comparison being made of the several alternatives possible.

Variations In Public Works Contract

A few years ago few contracts were let which could not be classed definitely as either "lump sum" or "itemized bid," and the form of contract, both general and in detail, was almost stereotyped. Now-a-days the arrangements made by public officials for having work done vary from the old forms, through numerous differentiations to performance directly by the officials themselves. Almost every issue of PUBLIC WORKS describes some plan slightly different from the others.

We have cost plus fixed sum, plus fixed percentage, plus variable percentage; lump sum or itemized bids with additions or deductions to allow, wholly or partly, for variations in cost to contractor of labor, materials, freight, etc.; payment of rental for contractor's plant and salary to contractor; furnishing material and possibly part of plant to contractor; and each week brings to knowledge some new idea on the subject, either adopted or proposed.

The contractors probably have had little to do with originating these, but the Associated General Contractors are urging the acceptance by officials, and "parties of the first part" generally, of certain principles to be embodied in contracts of whatever form, which will tend to relieve them of the uncertainties and risks which they are now compelled to assume. A contract is an agreement between two parties which is presumably mutually satisfactory and equally advantageous to both; and the desires of the contractors should certainly have equal weight with those of the other parties to the contract in the preparation of the contract terms.

Of the numerous forms of agreement being tried out many are demonstrating their improvement over the older ones; state laws, unstability of market prices, labor and other local conditions often determining the efficiency or otherwise of certain features of the agreement.

The result, it seems to us, can not help but be an evolution of a few new forms of agreement for the performing of work by contractors, which will result in a closer and more amicable relation between them and the engineer in charge; a pride of the former as well as the latter in the excellence of the work completed; and in general, greater satisfaction to all fair-minded parties concerned.

Effective Strike Remedy

The strike of truckmen, longshoremen and others that was intended to throttle New York City, extort still higher wages and compel the acceptance of closed shop in all freight handling there, has been frustrated by a very simple and obvious expedient that should promptly be put into force in many other situations.

The victims (or rather the most direct victims, for the entire city and many national interests suffered present loss and great future danger) simply organized and financed a system of doing the work that the strikers refused to do, and in less than two weeks, assisted by individual operators, moved more than 6,000 tons of freight which congested the coastwise piers, and now have them cleared for normal transportation.

In this case the financial backing and public opinion were so strong that intimidation could not prevail against them, and the strikers did not dare to employ the sabotage and violence so general in large strikes. The result confirms the belief that very few strikes directed against governments, municipalities, utilities, or great industrial enterprises would succeed if life and property rights were adequately protected and strikes conducted in a legal manner.

The open shop is the cornerstone of industrial and commercial safety and is indispensable to the rights guaranteed by the Constitution of the United States. There is a malignant determination to destroy it which would quickly disappear if every business man would join in a universal crusade to

establish open shop wherever it is now lacking, by methods similar to those used so successfully in New York.

Farewell to Yesterday

It is reported that the French Parliament has authorized the demolition of the historic wall enclosing the city and the use of the military zone outside it for city improvements. It is proposed to completely surround the city by a park having an average width of about 750 feet which, with the grace and beauty that Paris always gives to her public monuments, will undoubtedly be a great improvement for the city, but it is regrettable that it will be made at the expense of the historic wall that made such an interesting landmark associated with so much that is vital and romantic in legend and history. Although the wall has long since ceased to possess important military value, it could not be considered quite useless because it interposed a sufficient barrier to restrict entrance to the city to definite thoroughfares and to provide an obstacle that would require ordnance or an appreciable length of time to remove it for the entrance of troops which of course it could not ultimately prevent.

No longer ago than the beginning of the great war, some of the gates in the wall were specially guarded in anticipation of the approach of advance troops of cavalry and for months afterwards there could still be seen adjacent to them, huge piles of structural steel hurdles ready to scatter over a long stretch of the boulevards with the intention of impeding the enemy sufficiently to enable the machine guns to operate efficiently.

Montreal Labor Convention

There is one important point in favor of the Montreal Convention of the American Federation of Labor; it has come out, naked and unashamed and announced its principles, stating its demands in no uncertain terms and giving due notice to the country that it will omit no effort to overthrow civil, financial, political, social and humane rights that may be opposed to its domination. It has passed many resolutions indicating complete disregard of the rights of all except members of the labor unions and has exhibited a monumental inability to co-ordinate cause and effect, as for instance in the clamor for the reduction of prices and the high cost of living at the same time that it insists on impossibly high wages, forgetful of the fact that, according to statisticians, about 80 per cent of the cost of all commodities goes to labor and that labor is therefore already accountable for four-fifths of the increased prices.

The convention voted support to the striking longeshoremen that by their unjustifiable demands are paralyzing both domestic and foreign trade and threatening the life and prosperity of great cities and of the whole nation.

They demand government ownership of railroads, in spite of the fact that the government control has already thrown that formerly wonderful efficient system into chaos little short of destruction, and still constitutes a great peril to the whole country.

They have directly attacked efficiency and production by the instructions to the executive councils to render all possible assistance to "abolish present unreasonable speed tests, time measuring devices and the unreasonable standards of personal efficiency in the postal service."

Their condemnation of military training in schools as "the first step," which results in the killing of the initiative and the characterization of compulsory military training as "unnecessary, undesirable and un-American" is a most unpatriotic and cowardly principle that if admitted by any large proportion of the inhabitants would make the country defenseless against both internal and external warfare and dangers.

They seek to throttle production and secure a monopoly dictating to the entire country by prohibiting immigration as illustrated by the demand for congress to cancel the agreement with Japan and absolutely exclude Japanese and other Asiatic immigration to this country.

They oppose conservative reliable government and the protection of citizens by their instructions to the executive committee to obtain the reinstatemen of the striking Boston policemen and to give the latter their moral support.

Evidently in recognition of the demands that labor has made on the great political parties, the Republican platform adopted at Chicago included planks recognizing the justice of collective bargaining, repudiating the principle of compulsory arbitration, demanding the exclusion from interstate commerce of the products of convict labor, and opposing no strikes except those actually directed against the government.

Notwithstanding these remarkable concessions for class privileges at the expense of the nation, the convention unanimously condemns the Republican platform as a document "defiant in its defense of the enemies of labor" and that "proposes an industrial enslavement and an abrogation of rights as precious as life itself."

It specifically attacks the Republican party because, among other things, it "denies labor the right to strike against the government; because it repudiates labor demands for repeal of compulsory arbitration sections of the Esch Cummins Transportation Act; because it "Aims to undermine sovereignty of Mexican people and fulfill the hopes and aims of those whose sole object is the exploitation of the people and boundless resources of Mexico;" and because it "fails to urge congressional legislation to prevent Federal courts using their authority in declaring unconstitutional acts passed by congress." In other words, it defies the laws of the country and demands that they be repealed and that new laws be made favoring the greed and domination of labor as opposed to the overwhelming majority of the general public.

If such impudent declarations as these do not demonstrate the immediate necessity for enacting and enforcing stringent legislation against government and utility strikes and to make responsible this great organization of irresponsibles, what will?

New Water Supply Works of Winnipeg*

By James H. Fuertes

This instalment discusses the probabilty of freezing in the aqueduct, and adapting of size, grade and location so as to minimize the cost.

Temperature of Water Flowing Through Aqueduct—As to temperatures of the water at Indian bay, as compared with the temperature in the city reservoir, after passage throgh the 100 miles of aqueduct, it may be remarked that there is practically no difference, at any season of the year. The temperature at the intake, as well as at the city reservoir, gradually decreases, from the time the ice begins to form on the lake in November until a minimum of 2°C (35.5F) is reached in December at the reservoir, persisting until March; from the time of the break-up in the Spring, generally in April, there is a gradual rise in temperature until a maximum of 22.50 (72.5F) was reached in July and August, being followed then by a gradual dropping until the freeze-up.

In the distribution system of the city the temperature of the water rises somewhat in winter and falls in summer. In the heart of the city, where the pipes are large and the quantities of water used are large, the temperatures do not vary more than a degree or two from those in the city reservoir; approaching the limits of the city there is a gradual rise in winter to a temperature of about 2.5C (38.5 F.), and in summer a gradual drop to a minimum of about 6°C (43°F).

The outstanding feature, respecting temperatures, is that throughout those cold winters, when the cold penetrates the ground sufficiently deep to cause thick hoar frost to collect on the arch of the aqueduct above the flowing water, enough heat is radiated into the water from the ground to a little more than balance that lost at the surface during winter, and the reverse during summer to enable this water to keep at a practically constant temperature while flowing about 100 miles.

This result bears out the predictions made in the report of 1913 that 4 feet of cover would be a sufficient protection to the aqueduct, as far as frost-proofing was concerned, although it was known that in some localities frost penetrated as deep as 9 feet in cold winters; in fact, in Winnipeg, small service mains freeze sometimes in June and July, at that depth.

Prior to the completion of the aqueduct, at the suggestion of Gen. Ruttan, formerly city engineer of Winnipeg for many years, an experiment was made in a completed portion of the aqueduct to reproduce, as well as might be, the conditions to be expected of the aqueduct when in operation.

A section of aqueduct was chosen, running westward from the Birch river crossing, at which point water could be diverted into the aqueduct, and turned out again after passing through 3 miles of the aqueduct, into a ditch at the west end of the section under test. As the aqueduct slope was too steep to control the flow by a dam at the lower end, three sand-bag dams were built in it, one at the lower end, and two others at intervals about 4,000 feet up stream.

This aqueduct had the standard 4 feet of cover of sandy, loamy material. Water was regulated to enter from the river at the rate of 130,000 gallons per day, and at that rate required about a week to travel the three miles before escaping, being held back by the dams, to subject the water to aqueduct temperature for about the same time that would be required for water to flow from Lake of the Woods to Winnipeg at the minimum rate of operation, 25 million gallons per day.

The first set of temperatures was taken on February 2nd, 1917, and they were as follows:-

	Air in Aqueduct	Water in Aqueduct	Depth of Water in Aqueduct
Entrance to Aqueduct...	29°	33°	3½"
1st Dam	36°	36°	40 "
2nd Dam	37°	37°	40 "
Last Dam	37°	37°	56 "

Temperature of outside air, —14°. Temperature of water in river, 32°.

No ice or frost appeared on roofs or walls of aqueduct or on the water flowing.

From the last dam to the 2nd, the depth of water decreased gradually from 56-inches to 3½-inches in about 3,500 feet, and remained at 3½-iches for about 1,000 feet. Between the second and first dam the depth decreased from 40-inches at the dam to 3½-inches in 2,500 feet, and remained 3½-inches to the first dam, about 1,500 feet.

Observation repeated in March gave practically the same results, although the outside air had raised to 32°F, and the long-continued cold had penetrated the backfill over the aqueduct, causing a strip of hoar frost 2 feet to 6 feet wide to form to a depth of ¼-inch on the inside of the top of the aqueduct.

CONTRUCTION RAILWAY

Owing to the inaccessibility of the country through which the aqueduct would have to be built, the long stretches of swamps, muskegs and trackless forests to be crossed, one of the essential featres of the whole proposition was the construction of a standard gauge railway, with numerous sidings, paralleling the aqueduct throughout practically its whole length, in order to open up the country and make it possible to deliver men, equipment and materials along the line of the work promptly and economically.

The railway was well built, heavily ballasted, and laid with 60-lb. steel rails. At the Winnipeg end it had connections through the transfer yard with all the railroads entering Winnipeg, so that freight could be handled and transferred at minimum cost and in quickest time.

Quite a bit of the road bed had to be carried on cross poles, logs and brush, covered with earth

*Continued from page 5.

and ballasted very heavily; and in some places a great deal of work was required, during operation, in the way of train-fills, to keep the road up to surface to prevent derailments. Work was begun on it in March 1914, and the rails reached Indian bay December 10th of the same year. The total cost, including equipment, was a little under $1,500,000 or about $13,100 per mile of track.

LINES AND GRADES FOR AQUEDUCT

Economical Depth of Cuts—The establishment of the proper alignment for the aqueduct involved a study of costs balanced against grade lines. The preliminary profile prepared for the report of 1913 furnished the base for comparisons. The cost of an aqueduct section on any given grade varied with the position of the invert with respect to the ground level. Very shallow cuts, requiring large embankment quantities for covering the aqueduct and very deep cuttings, both cost a great deal more per foot than a moderate average cut. Comparative estimates of cost, including the stripping, excavating, timber platform, concrete, and backfilling, showed that for local conditions and methods of payment, an average cut of from 4 feet for the smallest to 5.5 feet for the largest section gave the minimum costs per foot of completed work, and that with a range of half a foot either side of the most economical depth there was practically no difference in cost.

After the preliminary line had been run through from Winnipeg to Shoal lake it was found that there were three critical points through which this line had to pass—one was the west end of Snake lake, near the Lake of the Woods. Another was the crossing of Brokenhead river, where moving the line very far either side of the chosen crossing would greatly affect adversely the grade line, or increase the length of the inverted syphon required to cross this valley or plain. The last was the passing from the Brokenhead to the English river drainage basin, where there was but one low saddle to follow without swinging the line far away from the short route.

Foundation Conditions—With these points fixed, the problem resolved itself into finding the most suitable aligment, for the least cost, to connect the points into a continuous line. Had the country been dry or the sub-soil the same throughout, the problem would have been much simpler; but in places, although the natural ground level was at a favorable height, the sub-soil was so wet and soft as to be unsuitable to carry the aqueduct, requiring either (1)-a pile fondation; (2)-the removal of the soft ground to a solid bottom and the refilling of the trench with gravel hauled in by train and deposited and spread in the trench in water kept standing high enough to entirely submerge the gravel until the surface was raised a few inches above the finished grade of the aqueduct (many miles of foundation had to be prepared in this way); or (3)-the depression of the aqueduct sufficiently below the hydraulic grade to secure a solid bottom and the reinforcement of the concrete work so as to stand the resulting internal pressure.

As finally located there were nine of these depressed sections with pressure heads varying from 7 to 65 feet.

Effect of Slope on Cost of Aqueduct—The general problem as to alignment, therefore, was one of finding the line giving a grade averaging as close to the mean slope between termini as possible without diverging so far from the shortest practicable line as to have the extra length cost more than would be saved in concrete, excavation and foundation costs, by using a longer alignment on a flatter slope. Thus, with the 7-foot x 8-foot 3¾-inch aqueduct the line could be lengthened 14 per cent to avoid a cut 6 feet greater than the most economical depth of cut.

Excepting at the critical points spoken of, the entire country was so flat, so heavily covered with brush and timber, or so wet and boggy, that the eye was no guide in picking out the proper line. Levels had to be run on offsets from the preliminary lines, sometimes as far as 20 miles at right angles, along section lines that had been cut out, so as to get a comprehensive contour map, with contours at 1 or 2-foot intervals, to trace out thereon the best line to follow to secure good grades, good lines and avoid difficulities in other places.

In addition to this, soundings and wash borings had to be put down in soft places and in swampy areas to locate the hard sub-soil and determine whether to use a foundation fill, depressed section or pile foundation to get the aqueduct through, and determine the cost.

Hydraulic Gradient at East End of Aqueduct—In the establishment of the grade of the aqueduct there were some novel points. The first relates to the passage of the aqueduct from Indian bay to the valley of Boggy river, through a deep cut 9 miles long. The height of the water in Indian bay fixed the range of levels available to govern the entrance of the water into the aqueduct, and the depth of cutting, influenced greatly by the grade of the aqueduct, controlled also the size of the section, and hence the cost.

Naturally a very slight slope was adopted for the long 9-mile cut, at the end of which the grade steepened considerably, and this circumstance was availed of in the following way. The grade adopted for the nine mile cut was 0.11 ft. per 1000 and the depth of flow on this slope to discharge 85 million gallons daily through the 10-foot 9-inch x 9-foot section of aqueduct would be 7.25 feet. The slope of the next section was 0.279 per 1000 feet and the depth of flow, with the 8-foot 10¼-inch x 7-foot 5⅝-inch section was 6.26 feet for 85 million gallons daily discharge. By continuing the large section past the junction of the two grades and down on the steeper slope for 11,100 feet, then changing to the smaller section, the water surface at the junction of the flat and the steep slopes would drop to give a depth of flow of 4.98 feet instead of the 7.25 feet required to discharge the same quantity on the 0.11 grade, and the larger aqueduct would have the advantage of this additional slope without the necessity of dropping the aqueduct grade. In

other words, this expedient to secure discharging capacity made possible the placing of the invert grade, through the deep nine-mile cut, an average of about 10 inches higher than if the large section had ended and the smaller begun at the break of grade, and still discharge the required 85 million gallons per day at low water in Indian bay.

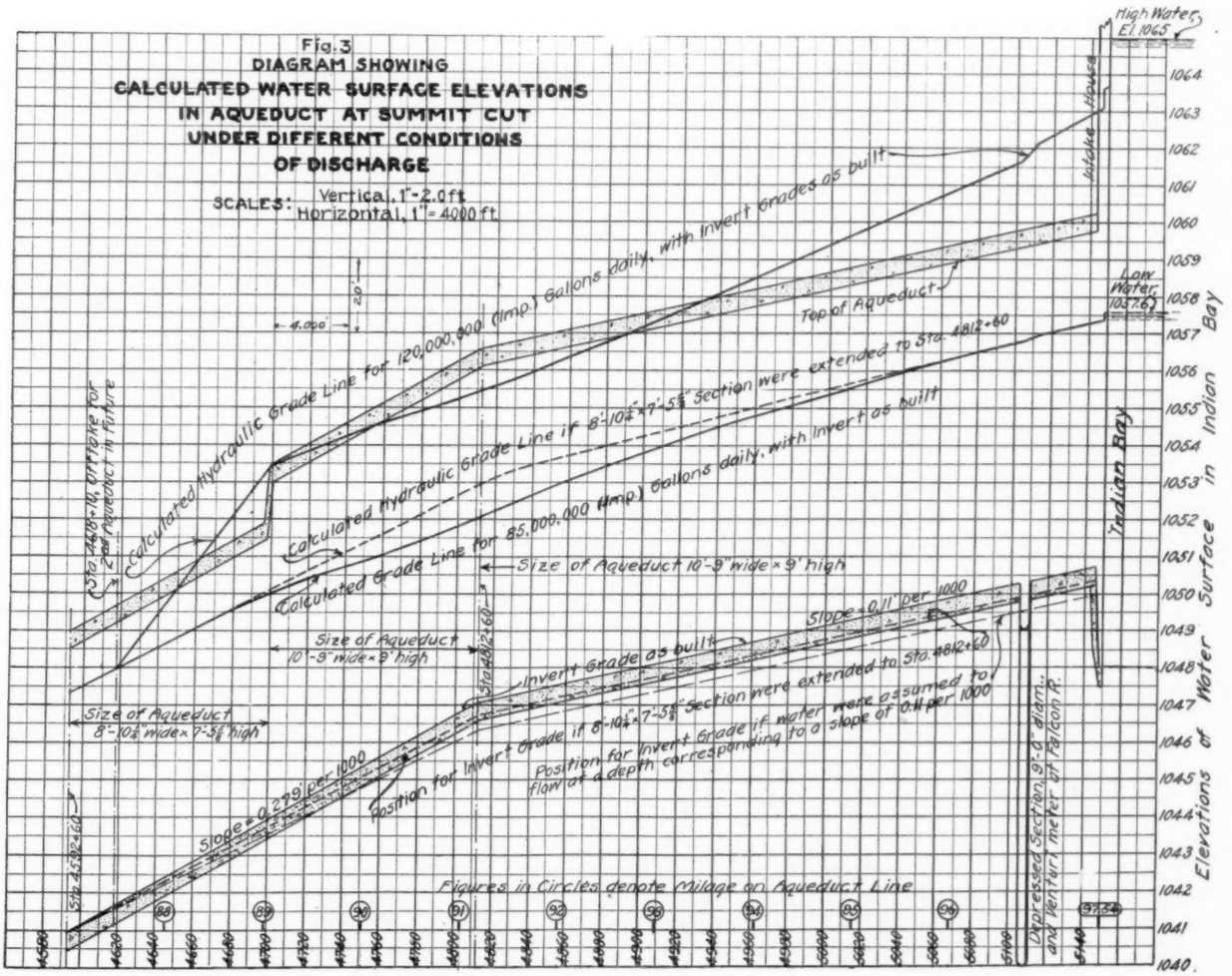
Also, using the 10-foot 9-inch x 9-foot aqueduct had the further advantage that at high water in the lake the capacity of this large section would be about 120 million gallons per day, so that at the very slight additional cost required for the larger section this portion, the most expensive of all the aqueduct, would not require duplication for a very long time in the future. These conditions are shown in the accompanying diagram.

Provision for 2nd Aqueduct for Increasing Supply in Future—Should, in the future, the rate of consumption pass the 85 million mark, it is contemplated to install a booster pumping station to raise the lake water the few feet required, when required, and run the aqueduct section under a slight head of from nothing to about 4-feet for the first 5 miles of its length.

Provision was made, in the works as built, for the junction of a second aqueduct to the existing one at the end of this extended large section, so that advantage could be taken of these conditions when the demand for water should exceed the capacity of the existing aqueduct, without interfering with the supply of water to the district.

General Description of Aqueduct—From this point to the site of the proposal equalizing reservoir at Deacon, about 12 miles from Winnipeg, the problem of grades was simply one of adjusting the alignment to secure that line which could be built for the least cost; in other words, equating lengths and corresponding unit costs as determined from the resulting grades and foundation difficulties to give the least cost between termini. Usually, in locating gravity aqueducts, there is little choice in selecting a route, topographical difficulties controlling and limiting the location to one practicable line.

In the case of the Winnipeg aqueduct, however, the country was so flat and its general slope so uniform that, as far as slopes were concerned, an aqueduct could have been run through on an almost straight line between Winnipeg and Shoal lake. Such an alignment would, however, have cost from two to three million dollars more than the one final-



ly located, although several miles shorter, as it would have consisted of long stretches of nearly level grades, joined by short stretches of steep grades, and the resulting aqueduct would have been made up of a large percentage of large sections and a small percentage of small sizes of aqueduct.

From the intake westward to within about 17 miles of Winnipeg, a distance of 80 miles, the slope of the ground is such that a gravity aqueduct, planned to run not quite full, was used. The section is horseshoe-shape, except where depressed below the hydraulic grades at a river crossing and near Winnipeg. These portions are circular and reinforced for internal pressures.

The largest gravity flow section is that through the summit cut above described, which is 10 feet 9 inches wide and 9 feet high on a slope of 0.58 feet per mile; the smallest is between miles 23½ and 32½, which is on a slope of 1.537 feet per 1,000 feet (8.11 feet per mile, the steepest slope on the whole line) and is 6 feet .4¾ inches wide and 5 feet 4¾ inches high.

HYDRAULIC GRADIENTS AT WINNIPEG END OF AQUEDUCT

From Mile 17 westward toward Winnipeg the ground falls off in elevation so that, to deliver water into the Winnipeg reservoir, the aqueduct must run under pressure, and here again enter some interesting hydraulic problems. All the aqueduct above described, that is from Mile 17 eastward for 80 miles, has a discharging capacity of 85,000,000 imperial gallons daily, a quantity far in excess of the needs of Winnipeg for many years.

General Conditions—The plans as worked out for this western end are based on construction details such that quantities up to 28,500,000 gallons daily may be delivered by gravity through the system into the McPhillips street reservoir in Winnipeg at elevation 769.5, which is high-water level in that reservoir. That is, from the western end of the gravity flow aqueduct at Mile 17 to Deacon, at Mile 13, there is a depressed section, having a diameter of 8 feet, followed by 49,900 lin. feet of 5-foot 6-inch lock-joint pipe, reaching to Red river in Winnipeg; than a 5-foot diameter cast iron lined inverted siphon under the river, and a 41 inch lock-joint reinforced concrete pipe 11,400 feet long through the streets of Winnipeg to the McPhillips street reservoir.

As a part of the system, but not for immediate construction, it is planned to provide at Deacon, where the 8-foot and 5-foot 6-inch concrete pipe sections join, a large reservoir holding 250,000,000 gallons of water to serve as an equalizing basin and as a safeguard against temporary interruption of flow from Shoal lake, should this be necessary to permit repairs or cleaning of the aqueduct.

The natural ground level at the site chosen for this large reservoir is at an average elevation of about 774.5 and the water level will vary in service from 791.0 to 797; in other words, it will stand from 16.5 to 22.5 ft. above the level of the surrounding prairie.

The higher level represents the condition when about 20,000,000 gallons is going by gravity to the McPhillips street reservoir, and the lower when about 115 million gallons daily is leaving the reservoir and is distributed to the various communities forming the water district, 35 millions going to the bank of Red river by gravity and being boosted thence through the 48 inch pipe line to the McPhillips street reservoir, and the balance being distributed to the city and its associated communities from other points.

In order to properly consider the hydraulic problems involved in the west end of the aqueduct, from the Deacon reservoir to Winnipeg, it will be necessary to say a word about the quantities of water required by the different communities forming the district, the rates at which it must be supplied, and the obligations of the district to its component parts in the matter of purveying the water.

ESSENTIAL CONDITIONS IN GREATER WINNIPEG WATER DISTRICT ACTS

1. The corporation is required to furnish water "in bulk" to the several communities forming the district. The context of the Act discloses that the words "in bulk' mean quantities of water at ground level rather than at city street main pressures. In other words, while the District is not authorized to pump water into the street mains of any of the municipalities, it is commanded to furnish water to any one or all, in such quantities as they may severally or collectively need from time to time, by gravity if possible, and, if not, then by pumping to sufficient head to cause the water to flow from the nearest convenient point on the District's main conduit to the nearest point at the corporate limits of the municipality in question. However, this Act specifically states that the main conduit shall terminate at a point adjacent to the McPhillips street reservoir in Winnipeg.
2. Any municipality having water conveyed to it from the District's main conduit through a special connection and branch conduit, shall pay the District annually half the interest, sinking fund, maintenance and operation costs in respect of plant and construction required to convey water from the main conduit of the corporation to the municipality in question.
3. Any municipality having a system of water mains may deliver water through these, in bulk, to another municipality.
4. The corporation is not required to build a main to deliver water to any municipality when another municipality is willing and able to deliver it an adequate supply, but may be required to later build such a main, if the aforesaid arrangement is terminated.
5. The coporation may bear, in whole or in part, the cost of extending the existing mains of any muncipality to the boundary of another to avoid the cost of direct mains from its work.

The total cost of work under contract and under way in Philadelphia since early January on Municipal improvements, including paving and construction of sewers, bridges and water supply systems, is $7,030,636. This amount covers 278 contracts, 164 of which, totalling $3,638,250, were for paving work. Seventy-two contracts are for sewers and contracts awarded by the Water Bureau total 34.

The Board of Estimate and Apportionment of New York City has appropriated $4,177,000 for motor operated snow removal equipment, for the department of street cleaning.

Immigration Notes

During the second week in June there arrived in New York 9,432 immigrants. Their distribution to their final destination is considerably delayed by lack of facilities which are serious, according to Commissioner Frederick A. E. Wallis, who says that the station at Ellis Island is over-crowded and that "this dragging along with stagnated inspection, overcrowded witness rooms, and the consequent unpardonable delay to aliens who are eager to get to their destinations, must be corrected or we will be swamped by the increasing flow of immigrants."

The literacy test to which these immigrants are submitted consists of reading, in their native language or any other language that they may choose, 30 or 40 words from the psalms. A large number of different verses are printed separately, in all languages, on cards that are used by the inspectors in such a way as to prevent fraud by memorizing verses previously given out.

Scores of colonies of Mennonites, discouraged by the severe climate in Manitoba and Saskatchewan, Canada, having an estimated total of about 8,000, are immigrating rapidly to the lower Mississippi valley.

Notwithstanding the heavy draft required to support the standing armies still maintained in Europe, an increasing number of their working men are immigrating to this country, and the accessions to labor here are important, though far less than the prewar ratio. The passport laws compel the prospective immigrants to obtain the visé of the American consul nearest his residence and also of the American consul at the port of embarkation; restrictions which, while somewhat reducing the number of immigrants, undoubtedly tend to secure a much better class. Most of them come, it is said, with a direct objective, such as to join friends or relatives already settled here, and much good could be accomplished by a competent, disinterested organization that would instruct and persuade and assist these immigrants to locate at those points and in those industries where they are most needed.

While construction, agriculture and general industries throughout the country are suffering and pleading for a great amount of labor of all sorts, there appears to be no abatement of the Pacific Coast opposition to Asiatics, and Governor Stevens of California has just addressed a letter to U. S. Secretary of State Colby, in support of the federal initiative of measures to deny Asiatics the right to all land purchases.

The Governor, while disclaiming animosity against the Japanese, does not wish them to settle in California or to develop a Japanese population there. He states that within the last ten years the Japanese population in California has increased from about 41,000 to 87,000 and believes that government action is necessary to prevent them from retaining possession of agricultural lands through personal employment contracts. If the Japanese are not desirable land holders it is still to be proved that they may not be exceedingly efficient and reliable industrial workers, of which we stand in such urgent need.

Since the close of the Revolutionary War 33,000,000 immigrants have entered the United States, and they and their descendants now constitute nearly 50 per cent of our total population. Between 1776 and 1890 there were 6,000,000 British immigrants and 5,125,000 Germans, but since 1890 only 1,023,000 Germans among 17,000,000 immigrants.

According to figures recently published in Ottawa, the immigration into Canada during April and March totaled a little over 24,000, or nearly 3,000 per week, of whom about 47 per cent came from the United States. During the same period the immigration into the United States hardly exceeded 12,000 per week, or only four times as much as that of a country with one-twentieth of the United States' population. If there had been no emigration from the United States to Canada the relative increase in the population of the two countries would still have been about 1 to 8½, or more than twice as great as the ratio of the respective populations.

During the week ending June 19, 10,527 aliens arrived at Ellis Island, New York, including nearly 2,000 reservists, of whom 1,500 were Poles who quit the mining districts of this country two years ago to join the Polish army. These have been inspected, sent to Camp Dix, and discharged. Contrary to the expectation of the immigrant inspectors, the immigrants now arriving are said to be of a noticeably better class than those coming to this country before the war. It is also interesting to note that deportations, which formerly sometimes exceeded 3 per cent of the arrivals, were only 885 out of the 152,987 immigrants received at Ellis Island during February, March, April and May, or only a trifle more than ½ of 1 per cent.

According to the Commonwealth Steel Co., St. Louis, 80 per cent of injuries received by their workmen were among the non-English speaking employees, who constitute only 34 per cent of the force.

K. G. Lober, New York representative of a Copenhagen Company, who arrived on June 22d from Copenhagen, is quoted in the New York *Tribune* as stating that the very serious industrial conditions now existing in Denmark are due to the policy of the radical party which has just been deposed from power. He says that the government faced bankruptcy through the law granting strikers 8 per cent of their wages while on strike, and that the workers refused to work more than about 10 or 15 hours per week but demanded and received 7 meals per day.

These conditions finally caused the overthrow of the radical power and the organization of the Danish Helpful Service, whose members immediately began the operation of many essential industries that were idle and furnished 300 volunteers, including bankers, lawyers, engineers and teachers, who worked all departments of the steamship Frederick VIII, just arrived from Copenhagen.

Recent Legal Decisions

MATERIALMEN'S LIEN FOR MATERIAL USED IN SEWER CONSTRUCTION

The Wisconsin Supreme Court holds, Worden Allen Co. v. Wisconsin Tunnel & Construction Co., 176 N. W. 877, that a sewer is machinery under the Wisconsin statute of 1917, section 3328, giving a materialman a lien for material used in the construction, repair, or removal of any building or machinery. In a materialman's proceeding against a city to recover for material furnished for the construction of a sewer the fact that part of the materials were turned over by the municipal contractor to another subcontractor did not deprive the materialman of his right to a lien, where the material was actually used in the construction of the sewer.

MATERIALMAN'S CLAIM AGAINST CONTRACTOR'S SURETY —EFFORTS TO COLLECT DEBT

The Oregon Supreme Court holds, City of Pendleton v. Jeffrey & Bufton, 188 Pac. 176, that under the Oregon statute, L. O. L., section 6266, requiring contractors on public contracts "promptly" to pay materialmen, a contractor's surety was obligated to pay such bills at maturity. The materialman's efforts to collect the amount due from the contractor by prosecuting the contractor's claim against the owner, foreclosing a mortgage assigned to it by the contractor, etc., did not release the surety for the remaining balance, where the latter had been kept informed of the materialman's efforts to collect the debt.

CONTRACT FOR SEA WALL HELD INDIVISIBLE MAKING CONTRACTOR LIABLE TO REPLACE PART DAMAGED BY STORM

The Connecticut Supreme Court of Errors holds, City of Bridgeport v. Scott, 109 Atl. 162, that a contract to construct a sea wall for a city involving excavation, masonry work, the use of concrete, the placing of riprap on the seaward side, the driving of piles, etc., payment to be determined on the basis of unit prices for each cubic yard of excavation, fill, cement masonry, etc., is an entire contract though the amount was left for ascertainment on the price basis and though the contract provided for payment by installments as the work progressed. The contractor could not, therefore, escape liability to replace a completed portion of the wall, damaged by a storm, on the theory that the contract was divisible.

SUBSTANTIAL PERFORMANCE OF CONTRACT FOR SEWAGE DISPOSAL PLANT

Action was brought for a balance due on a contract for the erection of a sewage disposal works in a borough, alleging substantial performance, and also for extra work and other items arising incidentally out of the performance, including increased cost from mistake in location and elevation of the works, excavations not contemplated and expense of maintenance of plant after completion and notice. The trial court on disputed facts directed a verdict for the borough. The New Jersey Court of Errors and Appeals holds, Braunworth v. Borough of Verona, 109 Atl. 343, that the question of substantial performance of the contract, as well as the defendant's liability under the contract for extra work and the other items involved, was for the jury, and reversed the judgment.

CALLS FOR UNIT PRICES FOR CONTINGENT EXTRAS AND WORK FOR WHICH NO UNIT PRICES ARE PROVIDED

A municipality advertised for proposals for lump sum bids for a sewage disposal plant complete, as per plans and specifications, and also unit price bids for contingent extras, work for which unit prices were not provided to be done for actual cost plus 15 per cent. The lowest bidder was awarded the contract. While he was in the midst of the work and the foundation which had been called for originally was nearly completed, the borough decided it to be unsafe to bear the burden proposed to be placed on it, and passed a resolution that the contractor be authorized and required to do certain work for which no unit prices were provided, the total cost of which proved to be far in excess of $500. After this work was practically completed, the borough stopped all work, and later ordered the contractor off the job. The contractor sued for payment for extras, delays caused by the borough, the maintenance of his plant and force on the job while idle, and the value of materials not incorporated in the work.

The New Jersey statute, P. L. 1912, p. 596, provides that whenever it shall be lawful for a public body to let contracts for doing work or furnishing materials or labor, where the sum to be expended exceeds $500, the action of such public body in entering into any such contract shall be invalid, unless there shall first be public advertising for bids and awards made to the lowest bidder. The New Jersey Court of Errors and Appeals holds, Ippolito v. Borough of Ridgefield, 109 Atl. 337, that there is nothing in that statute which forbids a call for unit prices for contingent extras and the doing of other work for which unit prices are not provided for cost plus 15 per cent. The insertion of such provisions in a contract is a protective measure to the public in the event of modification of the work caused by an unforseen emergency or as an incident to the work provided for in the original contract. The municipality is always protected, because whether this is so or whether the extra work is the result of an effort to evade the statute, are questions for the jury. Nonsuit was therefore reversed.

SUBCONTRACTORS, ABANDONING CONTRACT FOR CONTRACTOR'S DELAY, CAN SHOW CHANGED LABOR CONDITIONS

In an action for breach of contract by the general contractor for the erection of a postoffice building against the subcontractor for all the labor and material necessary to complete the building except pile

driving and excavation, it appeared that it was contemplated by the subcontract that work thereunder was to commence within a reasonable time after a certain date. The subcontractor repudiated the subcontract because of the general contractor's unreasonable delay in having the piling and foundation in proper shape for commencement of work by the subcontractor. It was held, Interstate Constr. Co. v. U. S. Fidelity, etc., Co., Michigan Supreme Court, 174 N. W. 173, that the subcontractor could show in the action that the changed labor conditions caused by the general contractor's unwarranted delay would have imposed an extraordinary and unwarranted burden on the subcontractor. Under the subcontract the general contractor was held under obligation to do the pile driving, pit digging and pile cutting before the subcontractor was obliged to perform the part of the work covered by the subcontract, as certainly as if the obligation had been so definitely expressed in the subcontract.

INACCURATE USE OF LANGUAGE IN FRAMING CONTRACTOR'S CLAIM

The contractor for the construction of a sewerage system for a borough was refused permission to complete the contract, the borough forcibly stopping the work. The contractor sued for damages and recovered a verdict and judgment. On appeal the borough contended that the contractor had "rescinded" the contract, and therefore could not recover under it. The contractor's notice to the borough on its breach of the contract read: "We consent to a rescission of the said contract and notify you that we do rescind for the above reasons. We demand that you give payment to us of all moneys due to date for work, labor and materials furnished to you under and pursuant to the terms of the contract at the rates mentioned in said contract." The New Jersey Court of Errors and Appeals holds, Cavanagh v. Bor. of Ridgefield, 109 Att. 515, that it is plain the contractor did not intend legal and technical rescission. The notice was in effect that, because of default on the part of the borough, the contractor would no longer attempt to proceed with the contract, but would hold the borough for moneys due under the contract. The language used was inapt, but the contract and attendant circumstances showed that what the contractor meant was in effect "you have stopped us and refuse to pay; very well, we submit, but claim for what we have done." This was not technically a rescission of the contract, but merely an acceptance of the situation which, as the jury must have found, was brought about by the fault of the borough. Judgment for the contractor was therefore affirmed.

SURETY MUST SHOW THAT CHANGE IN CONTRACT ALTERS COST

A contractor for street paving defaulted after giving surety bond and the city readvertised and awarded the contract to another. The contracts were alike, except that in the first the binder was to contain bitumen in quantity from three to five per cent. of the mixture, and the second from four to six per cent. of the mixture. The price in the latter contract was higher. The city sued the surety for the loss it suffered, and obtained verdict and judgment. The Pennsylvania Supreme Court holds, City of Philadelphia v. Ray, 109 Att. 689, that as the evidence did not show that at the time the change in the contract was made it resulted in an increase of cost, the trial court would not have been warranted in directing a verdict for the surety, and the judgment was affirmed.

CITY ENGINEER AS ARBITER UNDER CONTRACT AS TO EXCAVATION

Where the parties to a construction contract agree to abide by the decision of an engineer or architect having the supervision of the work, as to the amount and quality of work to be done and paid for, his decision is binding upon the parties unless it was based on fraud, dishonesty, or collusion. The Ohio Supreme Court holds, Fred. R. Jones Co. v. Fath, 126 N. E. 878, that the mere fact of disagreement between the representative of a subcontractor and the city engineer as to the quantity of excavation, and a settlement on his basis to relieve the city from liability to suit, which settlement the contractor accepted because of fear that the city would exact a penalty for not completing the work on time, is no evidence of fraud or bad faith on the part of the city engineer.

EXTENSION OF TIME—INJUNCTION OBTAINED BY CONTRACTOR

Under a provision authorizing the extension of the time for completion of a paving contract if the work should be delayed by an injunction, the Kansas City Court of Appeals holds, Williams v. Van Deusen, 219 S. W. 395, that the contractor cannot rely upon an injunction pronounced at his own instance and claim credit for the time caused by the delay arising therefrom. In Mc. Leod v. Genius, 31 Neb. 1, 47 N. W. 473, a building contractor was not given the benefit of time covered by a strike of his employees which was caused by his own wrongful and voluntary act. And in Mahoney v. Smith, 132 App. Div. 291, 116 N. Y. Supp. 1091, a voluntary lock-out by a contractor against his employees was held to be no valid excuse for failure to complete his work within the contract time, even though there was a clause in the contract making a strike a valid excuse for delay.

STREET PAVING TAX BILLS—PERFORMANCE OF WORK

In a proceeding by a paving contractor's assignee for mandamus to compel the city to issue tax bills for street paving, which the city refused to do because of defective work, the Missouri Supreme Court held, State v. Dickey, 219 S. W. 363, that mandamus would not lie where it was doubtful whether the contract had been performed, and the surety had failed to remedy the defects.

INTERFERENCE WITH CONTRACTOR ON PUBLIC WORK BY GOVERNMENT

The Circuit Court of Appeals, Eighth Circuit, holds, Sims, v. United States, 263 Fed. 48, that provisions of a government contract for building a levee that damage or injury to any part of the work before acceptance should be repaired by the contractor at his expense, did not require him to rebuild at his expense parts destroyed by flood and caused by acts of the government officer, who had, without warrant in the contract, taken temporary possession and excluded the contractor.

NEWS OF THE SOCIETIES

July 26-30 — INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Toronto, Canada. Secretary, Stephen E. Hoey, Municipal Bldg., New York.

Aug. 30-Sept. 3.—AMERICAN PUBLIC HEALTH ASSOCIATIION. San Francisco. Office of secretary.

Sept. 7-16.—NEW ENGLAND WATER WORKS ASSCOCIATION. Annual convention, Holyoke, Mass. Secretary, Frank J. Gifford, 715 Tremont Temple, Boston, Mass.

Sept. 13-17 — AMERICAN PUBLIC HEALTH ASSOCIATION. Boston, Massachusetts.

Sept. 13-17 — AMERICAN PUBLIC HEALTH ASSOCIATION. Annual convention, San Francisco, Cal.

Sept. 13-17 — SOUTHWESTERN WATER WORKS ASSOCIATIION. Annual convention, St. Charles Hotel, New Orleans, La. Secrtary, E. L. Fulkerson, Waco, Texas.

Sept. 20-23 — SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, St. Charles Hotel, New Orleans, La. Secretary, E. L. Fulkerson, Waco, Texas.

Oct. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention. St. Louis, Mo. Secretary, Charles Carroll Brown, 401 Lincoln Avenue, Valparaiso, Ill.

LOCAL ASSOCIATION OF AMERICAN SOCIETY OF CIVIL ENGINEERS

Southern California Association. Organized 1914. W. K. Barnard, president; Floyd G. Dessery, secretary, 514 Central Building, Los Angeles, Cal.

The Southern California Association of members of the American Society of Civil Engineers (Los Angeles, Cal.) holds regular monthly meetings on the second Wednesday of each month, the December meeting being the annual meeting.

Informal luncheons in connection with the Joint Technical Societies of Los Angeles are held at 12.15 p. m. every Thursday at the Broadway Department Store Cafe.

Spokane Association. Organized 1914. Alfred D. Butler, president; Charles E. Davis, secretary-treasurer, 401 City Hall, Spokane, Wash.

The regular meetings of the association are held on the second Friday of each month, except July and August.

Texas Association. Organized 1913. Hans Helland, president; E. N. Noyes, secretary, Deere Building, Dallas, Tex.

AMERICAN ENGINEERING COUNCIL

At its regular meeting June 17, 1920, after hearing a report on the Organization Conference, Engineering Council took the following actions:

"Voted: That Engineering Council heartily endorse the plan of organization of the Federated American Engineering Societies and the American Engineering Council, adopted by the organizing conference of technical societies in Washington June 3 and 4, and authorize its executive committee to proffer and perform on the part of council such assistance as may be practicable in completing the work of the Organizing Conference and of the Joint Conference Committee of the Founder Societies in establishing the American Engineering Council.

"Voted: That Engineering Council authorize its Executive Committee to deal with any question of co-operation with the Joint Conference Committee of the Founder Societies, relating to the permanent organization of the Federated American Engineering Societies, which may come up during the summer.

"Voted: That the secretary be instructed to invite to future meetings of Engineering Council delegates of the societies participating in the Organizing Conference in Washington, June 3 and 4, and editors of technical journals who may be interested"

CANADIAN INDUSTRIAL COUNCIL

The Industrial Conditions Act of Manitoba, enacted as a result of Winnipeg strikes, provides a joint council consisting of five members with one ex-officio judge; two representing employers, two employees, and one appointed by Governor to represent public. The council investigates all matters connected with industrial conditions, including cost of living, unemployment, unfair profits and unfair wages. The right of employees to bargain collectively is recognized and the sacredness of contracts is insisted on.

NEW YORK SECTION AMERICAN SOCIETY OF CIVIL ENGINEERS

At the annual meeting of the New York section, American Society of Civil Engineers, May 12, William J. Wilgus presented a paper on the railroad problems in relation to the metropolitan district, dealing with an immediate solution of the nation's railroad problem as the first consideration. It considered New York as the world's principal gateway to the United States and "the terminal sore spot" of the nation, and showed that the separation of New York City from the mainland is the principal cause of an intolerable situation, while the narrow piers without tracks, trains and motor-truck driveways are cause for excessive terminal costs and delays.

An outer beltline was suggested for linking New York City, other than Manhattan, with the mainland, and unification and electrification of the terminal zone, and the modernizing of the water-front were recommended as corollaries of the outer beltline.

Diffusion of terminals and markets, and store-door collections and deliveries were suggested for Manhattan, and Stapleton, Saten Island, was presented as an ideal location for modern port development. A continued failure to do anything to meet the situation constitutes an imminent danger to the community.

THE WESTERN SOCIETY OF ENGINEERS

At a regular meeting held June 21, the Western Society of Engineers, discussed a paper presented by L. Condron, on State Registration of Engineers which called attention to the lack of uniformity of rights and the responsibilities of engineers engaged in interstate practice and for the necessity of experience and attainments rather than high examination marks.

NEW HAMPSHIRE GOOD ROADS ASSOCIATION

The quarterly meeting of the New Hampshire Good Roads Association was held at Franklin, N. H., June 10th. The principal subjects discussed were snow plows and snow removers and the clearances of overhead bridges. A resolution protesting against the embargo on road construction materials was passed and copies were ordered to be forwarded to the state senators and congressmen. French roads and road-building were discussed by returned officers of the American Expeditionary Force that respectively applauded the superior excellence of French roads and the superiority of American road-building methods. The program included luncheon and an automobile over a section of the recently improved Hanover Road to Webster Lake.

MASSACHUSETTS HIGHWAY ASSOCIATION

The summer field day of the Massachusetts Highway Association at Quincy and at Nantasket Beach included a visit to the Squantum Works, luncheon, a trip through the Fall River Ship Works, addresses from a number of prominent men and a typical shore dinner accompanied by an elaborate cabaret show.

During 7 weeks in May and June, the Massachusetts State Department of Public Highways, has awarded five important contracts aggregating nearly $550,000,000 for cement concrete, bituminous concrete, and bituminous macadam roads.

SOCIETY OF MUNICIPAL ENGINEERS OF PHILADELPHIA

At its June 23rd meeting, the Society of Muncipal Engineers of Philadelphia elected as president, Frank E. Maize; vice-presidents, Charles Frommer, James S. Shute and Seth M. Van Loan; secretary, Chas. H. Stevens; treasurer, William J. Logan.

NASHVILLE ENGINEERING ASSOCIATION

A special committee of the Nashville, Tenn., Engineering Association has been appointed to raise an endowment fund of $500,000 for the engineering department of Vanderbilt University and to secure $10,000 for the purchase of machinery for the engineering laboratory there. At the present time suitable machinery can be bought from the United States government for a discount of 15 per cent less than cost and it is hoped that the city of Nashville will contribute $200,00 of the required endowment.

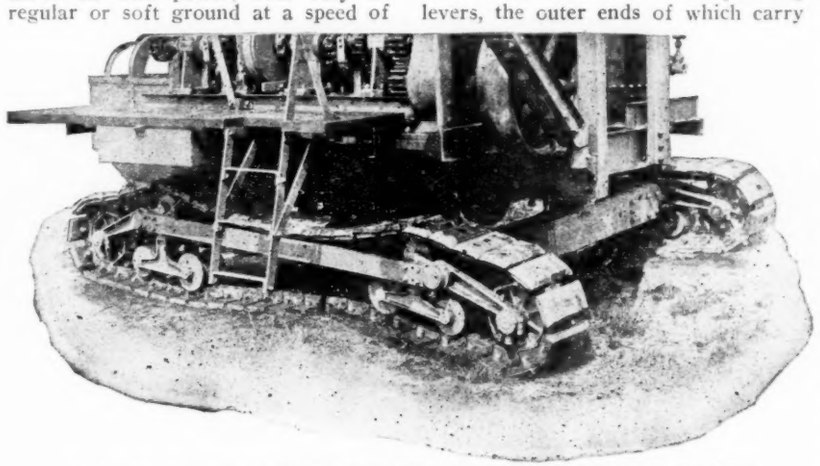
New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

RANSOME NEW CONCRETE PAVER TRACTION

The new 21-foot (wet mixed) Ransome paver weighs 22,000 pounds and can proceed almost anywhere under its own power, over very irregular or soft ground at a speed of ½ mile per hour forward or reverse, can move over the subgrade or the finished surface of any highway under construction without requiring any track laying, whenever there is steam in the boiler to operate the engine that drives the mixer, and the Marion crawler traction with a 10 foot x 13 inch bearing surface on each side of the machine that reduces the ground pressure to 10 pounds per square foot.

The mounted axles are equalizing levers, the outer ends of which carry the crawler driver. The inner ends carry a pair of rollers, that in turn are attached to an equalizing lever. This gives an equal distribution of weight over the sprocket, and the two carrying rollers in each group regardless of any unevenness of the ground.



CRAWLER TRACTION WITH EQUALIZING DISTRIBUTION OF WEIGHT

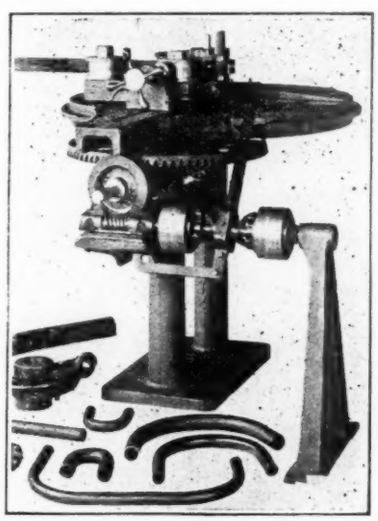
PIPE BENDING MACHINE

A power driven pipe bending machine with capacity up to pipes of an outside diameter of 2.375 inches has been put on the market by the Wallace Supplies Manufacturing Company. With it and the equipment shown in the illustration (where the small figure at the base is an additional forming head designed for 1-inch standard pipe) bends can be made cold, without the use of an inside follower, or floating mandrel, on pipe 1 inch, 1¼ inches, 1½ inches and 2 inches in inside diameter through an arc of 90 degrees to a radius of 6 to 14 inches. Special forms and inside follower bars can be provided to suit specifications.

The outside follower bar operates between the tube and the roller in such a way as to support the tube for a greater distance and obviate the depression which otherwise generally shows on the tube when the roller operates directly on the material.

The roller bracket is adjustable for forms up to 15 inches diameter and has a narrow screw adjustment to force the tube into the form and to hold the follower bar close to it. The machine is operated by levers for forward and reverse friction clutch pulleys with adjustable stops to suit any degree of bend required.

Tubes 1 inch in diameter with walls of 1-32 and 1-16 inch thickness can be bent with inside follower bars and outside follower bars to radius of 6 and 4 inches, respectively, and heavier tubes can be bent with the outside follower bar only. The addition of special equipment provides for easily transforming the machine for bending.



MACHINE FOR BENDING PIPE FROM 1 TO 2 INCHES IN DIAMETER

INDUSTRIAL NOTES

PROFITABLE MOTOR TRUCKS

A United States Motor Truck Company's model H 2½-ton truck was used three years for building roads in Mississippi, for hauling cotton seed and for service as a farm tractor with a very low rate of gasoline and oil consumption and a total bill of only $27.50 for upkeep. The owner was so much pleased that he secured the agency and has disposed of a number of this kind of trucks in his territory.

In another part of the same state a contractor built during last year 75 miles of gravel roadway with seven motor trucks, four of which were of the U. S. type, averaging 100 miles per day on 1 pint of gasoline per mile. The trucks were fitted with U. S. steel bodies having automatic tail gate release and spreading device, each of which saved the work of 4 men. The contractor figured that each truck did the work of 8 teams at one-quarter of the cost. The average cost for inspection and repairs for the season was $48.39 per truck.

LIME IN CONCRETE AND MORTAR

The National Lime Association has issued bulletin No. 303 entitled, "Test Data on Lime in Concrete and Mortar," a study of tests and experiments on the effects of hydrated lime when added to concrete mixtures under varying conditions and for varying purposes, together with comments and field observations, by T. B. Shertzer.

The pamphlet has 17 pages, illustrated, and gives data of tension tests conducted by the Chief of Engineers, U. S. Army, compression tests conducted by the H. M. Spackman Engineering Company Laboratory, beam tests conducted at the Pennsylvania State College, salt water tests made by the Dravo Construction Company at Sparrows Point, Maryland, watertight tests made by Sanford E. Thompson, Boston, tests on brick mortar and brick piers by Prof. J. S. Macgregor of Columbia University, and reports on their use on hydrated lime from a number of prominent engineers and contractors. This bulletin, together with a number of others referring to the use of lime in construction work will be sent free on application to the National Lime Association, Washington, D. C.

ELECTRO BLEACHING GAS CO.

The Electro Bleaching Gas Company, manufacturers of liquid chlorine, announce that they now have ready for mailing to interested applicants, a reprint from the Journal of the American Waterworks Associa-

tion of last year, entitled, "Relation of the Chemical Industry at Niagara Falls to the Waterworks." This reprint and discussion forms an 18-page illustrated article by John A. Kienle on the manufacture of chlorine and bleaching powder and on the chlorination of water supplies, with diagrams and other statistics showing the relation of chlorinated water supplies to typhoid death rates.

COMPRESSED AIR DATA

A series of twelve separate and independent chapters on various data connected with the development and application of compressed air to engineering and construction and mechanical operations, have been issued by the Ingersoll-Rand Company, neatly bound by them in a 4¼ x 6¼ flexible, gilt lettered cover, and distributed among engineers and contractors interested in the use of compressed air.

These data are comprehensive and authoritive and give a large amount of reference and detailed information of value in estimating, designing and conducting a large number and variety of important operations, especially in field work such as riveting, chipping, caulking, drilling, boring, tamping and hammering with pneumatic tools and the operation of tripod and jackhammer drills for rock cutting, quarry work and the like, for driving drift bolts or lag screws, for operating hoists and compressed air engines and pumps, for driving foundation piles and sheet piles, for painting and sand-blasting and for many other standard and special operations.

There are descriptions of work completed and of the methods of carrying out various operations, diagrams and instructions for installing equipment, definitions, and explanations, numerous tables of costs data, dimensions and other standard information together with illustrations of standard air tools and machinery and of their application. The book is on heavy calendared paper and contains 240 pages of attractive and well arranged data exclusive of 20 pages of indexing that enables any subject to be easily located.

AMERICAN-LA FRANCE COMPANY

The American-La France Fire Engine Company, Inc., announces the sale during April of pumping engines to 20 different cities, including Manila, P. I., and trucks, cars and other important apparatus to 13 other cities. The above shipments were supplemented by 70 sales of important apparatus during the same period of time

OUTING OF MORRIIS KNOWLES' EMPLOYEES

Employees of the organization of Morris Knowles, Inc., engineers, of Pittsburgh, Pa., participated in their regular annual outing June 12th at Woxford Park. Races and a baseball game were features of the afternoon, and many of the 200 employes, their families and friends participated. The ball game was between teams made up from the 12th and 13th floors and the 11th floor of the Jones Bldg., and resulted in a victory to the latter. The feast served at 6:30 by a special committee was laid on tables arranged under the trees. Jazz music was furnished by a local band and dancing continued throughout the evening.

Besides the local attendance there were present R. F. McDowell of the Cleveland Office, W. Wade Shidler of the Youngstown office, and several employees of the Windsor, Ontario, Canada office.

PERSONALS

Butts, C. M., has been appointed chief assistant engineer of Butte County, Cal.

Hanna, Davis, has been appointed superintendent of water works, Windsor, Ont.

Cunningham, Max L., state engineer of the Oklahoma Department of Highways has resigned to become vice-president and chief engineer of the Municipal Excavator Company, Oklahoma City, Okla.

Stayton, Col. E. M., civil engineer, has been appointed member of the Board of Control of the Kansas City Railway Company, representing the city.

Roberts, K. M., civil engineer, has been appointed general manager of the Chamber of Commerce, Beaumont, Texas.

Huntington, P. T., has been appointed city engineer of Chippewa Falls, Wisconsin.

Perring, H. G., has been appointed city engineer of Baltimore, Md.

Smith, R. D., railroad construction engineer, Chicago, died May 14th.

Spratt, T. A., has been appointed superintendent in charge of roads for the Ottawa Suburban Roads Commission.

Brindle, T. S., has been appointed chief engineer of Ohio State Highway Department.

Brandow, E. E., has been appointed bridge engineer Pennsylvania State Highway.

Givan, Albert, has been appointed assistant state engineer, California

Blunt, Grover A., has been appointed county engineer of Dubuque County, La

Dunn, H. L., has been appointed superintendent of street construction at Columbus, Ga.

Barstow, G. F., has been appointed location engineer of St. Louis County, Minnesota.

Lawyer, Van E., engineer of Schoharie County, New York, has been appointed supervisor in the New York State Highway Department.

Ford, F. L., has been appointed general manager of the Connecticut National Pavements, Inc.

Wright, John B., consulting highway engineer, has been appointed municipal manager of Springfield, Vt.

Wallace, Frank, has been appointed resident engineer of the U. S. Bureau of Public Works at Missoula, Mont.

Boutelle, Geo. J., has been elected city engineer of Chester, Pa.

Meacham, J. C., has been appointed engineer of road construction in Clay District, Marshall County, West Virginia.

Walmsley, J. M., has been appointed road superintendent Montgomery County, Pa.

Johnson, V. D., has been appointed engineer of street construction, Roanoke, Va.

Chapleau, S. J., Civil engineer, has been appointed representativ for Canada on the Board of Control for the construction of the compensating works in St. Mary's River.

Davey, W. B., chief engineer of the Orleans Parish Levee Board, has been appointed city engineer of New Orleans.

Sheridan, C. J., has been appointed deputy engineer of Yonkers, N. Y.

Brown, Fred, has been appointed City engineer of Muskegon, Mich.

Danforth, F. A., topographic engineer, U. S. Geological Survey, has sailed for Hawaii to begin the co-operative topographic survey there.

Williar, Major Harry D., Jr., has been appointed assistant chief engineer of the Maryland State Roads Commission.

Chadwick, E. E., has been elected city engineer of Winana, Minn.

Sweet, C. B., and L. V. Teesdale, have resigned positions in the U. S. Forest Product Laboratory, Madison, Wisc., to investigate commerical methods of seasoning timber in India.

Sydenstricker, J. H., has been appointed road engineer of Monroe County, W. Va.

E. M. Stayton, Lieut.-Col., has been made city representative of the Board of Control of the Kansas City, Missouri, Railways.

Rogers, L. L., has joined the firm of Roger Brothers, roadbuilders, with headquarters at Los Angeles.

Jewell, A. H., has been appointed chief engineer of the Kansas State Board of Health.

Widener, Carl, recently city engineer of Bozeman, Mont., will continue to do work on city improvements.

Palmer, H. E., has been appointed engineer of Wilkin County, Minnesota.

McCamman, James R., has been appointed surveyor of Eaton County, Michigan.

Read, L. C., has been appointed engineer of Sandusky, Mich.

Gregory, J. H., has been appointed service director of Columbus, Ohio.

Duffy, W. H., has been appointed consulting engineer in charge of water works improvement of Columbus.

McAteer, J. J., has been appointed a member of the Passaic Valley Sewerage Commission.

Holway, W. R., has been appointed consulting engineer for water and sewerage works at Tulsa, Okla.

Verharen, A. W., has been appointed city engineer of Helena Montana.

Ryan, Thomas, former superintendent of Water Works of Chicago, died May 31.

Foley, Timothy, a contractor, died at his home in St. Paul, May 25, aged 82.

Broenimann, A. E., a member of the survey staff of the New York State Deep Waterway Commission, died. May 29 at Watertown, Wis.